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LETTER
OF
THE VICE-PRESIDENT OF THE NATIONAL ACADEMY
OF SCIENCES,
COMMUNICATING,

*In obedience to law, a report of the proceedings of the Academy during the year
1866.*

MARCH 9, 1867.—Referred to the Committee on Printing.

MARCH 19, 1867.—Ordered to be printed, and 1,000 additional copies for the use of the
Academy.

NATIONAL ACADEMY OF SCIENCES,
Washington, D. C., March 7, 1867.

SIR: In accordance with a provision of the law establishing the National
Academy of Sciences, I have the honor to submit to Congress the accompany-
ing report of the proceedings of the Academy during the year 1866.

I have the honor to be, very respectfully, your obedient servant,

JOSEPH HENRY,
Vice-President of the National Academy.

Hon. B. F. WADE,
President of the Senate of the United States.

REPORT.

The National Academy of Sciences held during the year 1866 its two stated
sessions for the transaction of general business, and the discussion of the reports
and papers presented for its consideration.

The first of these sessions was held January 24, 25, 26, and 27, in the city of
Washington; the second was held August 7, 8, 9, 10, and 11, at Northampton,
Massachusetts.

The president having been absent on account of protracted illness, and the
vice-president having been compelled by the precarious state of his health to
resign, it became necessary that the office of vice-president should be filled
immediately. This was done January 25, by the election of Joseph Henry.
On taking the chair, Mr. Henry stated that while he was highly honored by the
election, he felt much hesitation in accepting the office, since his duties in con-
nection with the Smithsonian Institution were more than sufficient to occupy his
attention, and that he could only accept the responsible position with the under-
standing that he would be permitted to retire as soon as the president should be
able to resume his duties, or his place could be filled by another.

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Vacancies in the Academy were filled by the election of Samuel W. Johnson to the section of chemistry and mineralogy, George P. Marsh to the section of ethnology and philology, and Alexander Agassiz to that of zoology.

The council for the year 1866 consisted of Messrs. M. C. Meigs, B. A. Gould, J. L. Le Conte, and W. D. Whitney.

At the sessions of 1866 thirty-eight papers on various branches of science were presented for discussion, and several reports, principally relative to subjects referred to the Academy for investigation by departments of the government of the United States.

The following is a list of the titles of the memoirs presented:

1. On the silver reduction process of Nevada, with statistical tables and metallurgical data: by B. Silliman.
2. On a new general method of volumetric analysis: by W. Gibbs.
3. On sodium amalgam and its applications in separating precious metals, especially gold: by B. Silliman.
4. On the limits and character of the vision of American soldiers as deduced by the statistical department of the Sanitary Commission: by B. A. Gould.
5. On the primary triangulation of the coast of New England in connection with the United States coast survey: by A. D. Bache.
6. On the relation of language to ethnology: by W. D. Whitney.
7. On certain mineral districts of Arizona: by B. Silliman.
8. On California petroleum and the products of its distillation: by B. Silliman.
9. Observations on the annular eclipse of October, 1865, made at Lebanon, Illinois: by Stephen Alexander.
10. On a photometric method: by Ogden N. Rood.
11. On a normal map of the solar spectrum: by Wolcott Gibbs.
12. On traces of glaciers under the tropics: by L. Agassiz.
13. On the secular acceleration of the moon's mean motion: by John N. Stockwell.
14. On the origin of solar heat: by Benjamin Peirce.
15. On the morphological value and relations of the human hand: by B. G. Wilder.
16. On the correlation of gravity and temperature: by P. E. Chase.
17. Grounds of analogy between linguistic science and the physical sciences: by W. D. Whitney.
18. On the limitation of homologies: by L. Agassiz.
19. On a new method of optical analysis: by Wolcott Gibbs.
20. On recent soundings in the Gulf Stream: by Henry Mitchell.
21. On repeated linear substitutions: by J. E. Oliver.
22. On some points in the geological structure of southern Minnesota: by James Hall.
23. A new theory of planetary motion: by Theodore Strong.
24. On the linear evaluation of surd forms: by William Watson.
25. On the study of young animals, and its bearing upon the progress of paleontology and zoology: by Alexander E. R. Agassiz.
26. On the mass of the satellites of Saturn: by Benjamin Peirce.
27. On a remarkable rainbow: by Benjamin Peirce.
28. Investigation in regard to sound in its economical applications: by Joseph Henry.
29. On the geographical distribution of fishes in the waters of the Amazon: by Louis Agassiz.
30. On the stature of American soldiers: by B. A. Gould.
31. On the influence of the hour of the day on the heights obtained by barometric measurements: by Arnold Guyot.
32. On astronomical photography: by Lewis M. Rutherford.
33. On the reduction of photographic observations, with a determination of

the position of the pleiades from photographs by Mr. Rutherford: by B. A. Gould.

34. On a table for facilitating the conversion of longitude and latitude into right ascension and declination: by William Ferrel.

35. On the nephila plumipes, or silk spider of South Carolina: by B. G. Wilder.

The following is a synopsis of reports made by committees of the Academy:

January 26, 1866.—Mr. F. Rogers, from the compass committee, reported that its labors are still continued, and that a number of compasses belonging to national vessels had been corrected. Also, at the request of the members, Admiral Davis had been appointed chairman of the committee.

On the 26th of January Mr. Rogers, from the joint commission of the Academy, the Navy Department, and the Franklin Institute, on the expansion of steam, reported that the experiments were still in progress, but owing to the large number of trials necessary to eliminate practical sources of error, the investigations have been much extended, and the report consequently delayed.

January 27, 1866.—Mr. Henry, from the committee on weights and measures, made the following report, which was adopted:

The committee on weights, measures, and coinage respectfully report:

That they are in favor of adopting ultimately a decimal system, and that in their opinion the metrical system of weights and measures, though not without defects, is, all things considered, the best in use.

The committee therefore suggest that the Academy recommend to Congress to authorize and encourage by law the introduction and use of the metrical system of weights and measures, and with a view to familiarize the people with the system, the Academy recommend that provision be made by law for the immediate manufacture and distribution to the custom-houses and States of metrical standards of weights and measures, to introduce the system into the post offices by making a single letter weigh 15 grams instead of $14\frac{17}{100}$ or half an ounce; and to cause the new one-cent and two-cent pieces to be so coined that they shall weigh respectively 5 and 10 grams, and that their diameter shall be made to bear a determinate and simple ratio to the metrical unit of length.

On the 9th of July the Hon. Hugh McCulloch, Secretary of the Treasury, asked for the appointment of a committee of the Academy on proving and gauging spirits subjected to duty. In accordance with this request the following committee was appointed: Joseph Henry, J. E. Hilgard, M. C. Meigs.

Messrs. F. A. P. Barnard and J. Torrey were requested to prepare a series of standard mixtures of spirits and water for the adjustment of the scales of standard hydrometers, and a similar service was, at the request of the committee, undertaken by Dr. B. F. Craig.

The account of the doings of this committee up to the end of the year is given by Mr. Hilgard in Appendix No. 3. From this it will be seen that the duty devolved upon the members of the committee was one of much labor and responsibility. The tables accompanying the report are of much value, and will be referred to by all persons engaged in pursuits requiring a knowledge of the specific gravity and volume, at various temperatures, of alcoholic spirits of different strength; they are not only indispensable to the distiller, rectifier and gauger of spirits, but will prove extremely useful in the laboratory of the chemist, and in many processes of manufacture involving the use of alcohol.

Dr. Torrey, chairman of the committee on the prevention of the counterfeiting of the national currency, reported that since the last session of the academy the committee had been called together at the request of the Treasury Department, and that, in accordance with a resolution of the Academy, they had reported directly to the Secretary of the Treasury the results of their investigations relative to the matter submitted to them. The reason for presenting the report to the Secretary of the Treasury without submitting it to the academy was the confidential character of the matter to which it pertained.

On the 13th of July, 1866, the Hon. W. H. Seward, Secretary of State, requested that a committee of members of the Academy might be appointed to investigate the practicability and best means of improving the navigation of the lower San Juan river and of improving the harbor of San Juan del Norte in Nicaragua. This request was made on application of the minister of the republic of Nicaragua in order to obtain trustworthy information on a subject of much importance to his government.

In accordance with this request the following members of the academy, especially fitted by their previous studies and experience, were appointed to make the required investigations: A. A. Humphreys, chairman, C. H. Davis, J. E. Hilgard.

Mr. Henry Mitchell, assistant in the United States Coast Survey, not a member of the academy, was added to the committee. The report of the committee, which is given in Appendix No. 1, was presented directly to the Secretary of State, in accordance with article V, section 4, of the by-laws.

The following resolutions were adopted by the academy August 10, 1866:

Resolved, That the National Academy of Sciences has heard with great satisfaction the passage by the Congress of the United States of a law authorizing the employment of the metrical system of weights and measures. That in the opinion of the academy such legislation is worthy of our country as identifying it with the scientific progress of the age

Resolved, That the National Academy of Sciences earnestly recommend to the State officers having charge of the subject of public education to require the employment of the metrical system in works on arithmetic and other branches of science taught in the public schools, and to take such other measures as may insure the introduction of the system by educating the people to appreciate its advantages.

In connection with this resolution it may be stated that a series of tables for converting the weights and measures of the metrical system into those used in this country have been prepared, principally for the use of schools, by Professor Newton, one of the members of the academy, and printed for gratuitous distribution by the Smithsonian Institution.

On the 8th of January, 1867, a letter was received from the War Department requesting information as to whether a coating of zinc on iron blocks used for headstones would produce a galvanic action tending to hasten the oxidation of the iron. This subject was examined by a committee consisting of the following members, viz: Joseph Henry, J. H. C. Coffin, Joseph Saxton, whose report is given in Appendix No. 2.

Respectfully submitted:

JOSEPH HENRY,
Vice-President National Academy of Sciences.

Hon. B. F. WADE,
President of the United States Senate.

APPENDIX I.

Report of the Committee on Greytown Harbor, Nicaragua.

DEPARTMENT OF STATE,
Washington, July 12, 1866.

SIR: The department has received a communication from the minister of the republic of Nicaragua containing a note addressed to him by Mr. J. E. Hilgard, in charge of the United States Coast Survey office, recommending the appointment of a board to consist of the members of the Academy of Sciences, of which

you are the vice-president, for the purpose of investigating and reporting upon the practicability and best means of improving the navigation of the Lower San Juan river, and reclaiming the harbor of San Juan del Norte, in Nicaragua, which recommendation is fully approved by the minister in his communication to this department. He recommends in addition that Mr. Hilgard form a member of the board, whom he represents as possessing the necessary charts and reports, and as being well advised on the difficult subject to be investigated.

It may not be unnecessary to mention the fact that by a contract entered into between the government of Nicaragua and the Central American Transit Company on the 10th of November, 1863, the latter undertakes to effect a good interoceanic transit through the republic of Nicaragua.

I would thank you if you would act upon the suggestion of the minister of the republic of Nicaragua; and, in the event of the organization of the board, I will beg of you to instruct the same, that should a good interoceanic transit be found impracticable under the limitations contained in the contract of the Central American Transit Company, above referred to, to inquire into the expediency of effecting such transit way within the region surveyed by Captain West.

I have the honor to be, sir, your obedient servant,

WILLIAM H. SEWARD.

Professor JOSEPH HENRY, &c., &c., &c., *Washington.*

SMITHSONIAN INSTITUTION,

September 20, 1866.

SIR: I have the honor to inform you that in compliance with your request of July 12th, 1866, the subject of the improvement of the river and harbor of San Juan del Norte, in Nicaragua, was referred to a committee of the National Academy of Sciences, and that this committee has made the investigation required, and now through me presents the accompanying report.

The committee, which was chosen with reference to special fitness from previous study and experience for the investigation, consisted of the following members of the Academy: A. A. Humphreys, major general and Chief Engineer United States army; C. H. Davis, rear-admiral United States navy and Superintendent National Observatory; J. E. Hilgard, assistant United States Coast Survey, acting Superintendent.

In accordance with article II, section 4, of the act of incorporation of the Academy, Mr. Henry M. Mitchell, of the United States Coast Survey, (not a member of the Academy,) was appointed to assist in the investigation.

The committee, after a careful study of all the materials furnished by Don Luis Molina, and those obtained from other sources, has arrived at conclusions and are enabled to give suggestions, which, it is hoped, may be found of value to the government of Nicaragua, and of importance to the commerce of the world. The report of the committee points out the causes and progress of the deterioration of the harbor of Greytown; considers the question of its partial restoration, and the means to be adopted to attain this end. It also considers the problem of increasing the depth and volume of water in the river as an essential condition of the improvement of the entrance of the harbor, and presents a definite opinion as to the results which may be expected when the works which are indicated shall have been completed. It discusses the availability of the Colorado pass, and closes with a recapitulation of all the conclusions.

I have the honor to remain, very truly, your obedient servant,

JOSEPH HENRY,

Vice-President of the National Academy.

Hon. WILLIAM H. SEWARD,

Secretary of State.

REPORT.

The committee of the National Academy of Sciences, to whom has been assigned the duty of examining into the practicability and best means of improving the navigation of the lower San Juan river, and reclaiming the harbor of San Juan del Norte, or Greytown, in Nicaragua, have made a careful study of all the maps and documents placed before them by Don Luis Molina, minister from Nicaragua, and herewith present this report.

This report first reviews the conditions under which different classes of harbors exist; then traces the history of the harbor of Greytown, develops the causes of its deterioration, and points out the further progress of the same; next addresses itself to the question of its partial restoration, and the means to be employed towards that end; the means of increasing the depth and volume of water in the lower San Juan river are next considered, this being an essential condition towards the improvement of the entrance. A definite opinion is expressed as to the best result that may be expected when all the conditions laid down shall have been fulfilled; and the observations are detailed which are requisite to be made in order that adequate works may be planned. Lastly the availability of the Colorado pass is considered, as far as the known facts would warrant.

The conclusions are briefly recapitulated at the end. Appended to the report is a list of the maps and documents that have been consulted by the committee.

GENERAL CONSIDERATIONS RELATING TO HARBORS.

Many and complicated as the forms of harbors may seem to be, a close observer soon learns to group them into a few classes or types, which are distinguishable by natural peculiarities in their manner of construction and conservation. We have been familiar in our surveys with four grand types, viz: *arms of the sea*; *embouchures* or *estuaries* of rivers; *inlets*, and *bights* or *hooks*.

As arms of the sea we should designate all those bodies of water which occupy depressions or valleys whose existence may be conceived to have been antecedent to the influx of the ocean, or, at least, to the positive action of sea water.

In the embouchure of rivers an expansion or divergence of the land waters occurs at the sea border or in the low country near the coast; and in alluvial countries the communication with the sea is always beset with shoals, which often take the character of bars. In the order and arrangement of these shoals or bars, the action of an *interior* force working *seaward* is exhibited; and the limit of this force, as an effective working agent, is usually well defined.

With the declining velocity of its outflow, a river deposits near its mouth the material which it bears or rolls upon its bed. Sometimes these deposits are made at successive points, a distribution of materials according to form, size, and specific weight being made; but often they are thrown down abruptly at points of sudden loss in the carrying power due to the divergence and waste of the stream upon the sea. It is a mere axiom to state that below or beyond a certain depth a river has no longer the capacity to scour away or bear forward the same material, unless its velocity is augmented by some extraneous influence—by the forced confinement of its waters to a narrow channel or by the reinforcement of tidal or other streams. If the material swept down to the mouth of a river is there exposed to agitation from breakers, a border of sand usually appears, which is the residual of a process of disintegration.

An *inlet*, in the familiar use of the term which it obtains in this country, is simply a breach made in the cordon of sand which skirts our alluvial shores. The land waters, pent up within a barrier of sand, thrown up by the sea and wind, finally burst through at the weakest point, and then concentrating their

forces, dig out a narrow, but often a deep channel, to the sea. *Inlets* which have existed for any length of time *are always barred*. The power of the out-flow suffers a sudden decline as the waters diverge upon the open sea and are broken by the waves, so that the material which it removed on the beach is soon relinquished. The two grand characteristics of an inlet (or outlet, as it should be called) are these: *a maximum depression at the opening through the sandy barrier, and an outside bar* formed of the material of this barrier.

An inlet harbor, like a river mouth, is formed and maintained by forces acting from within, outward.

A *bight* is formed on what may be called the lee side of a point or elbow, by the waves or currents of the sea, whose direction of motion is essentially constant. It may be simply a re-entrant angle in the shore line, as the Cove at Cape Hatteras; or the lee under Cape Lookout; it may form a perfect harbor, as Provincetown, in Massachusetts; or it may, as a final stage of development, wholly enclose a district of sheltered water, and become a lagoon. In this class of harbors the grand feature is the protection offered by the angle of sand, which cuts off the basin from the sea; so that the forces which may be said to construct a bight or hook harbor are wholly from *without*.

We have seen within the limits of our own experience many small bights which have passed through the three stages we have named; and we recognize in this new case of Greytown harbor only another illustration of the same progressive action of an external force shaping the boundaries of the sea.

2. GREYTOWN HARBOR—ITS DECLINE AND MEANS OF IMPROVEMENT.

Greytown harbor is situated just within a projection of the shore of Nicaragua, at the southern extremity of a slight bend or concavity in the general coast line. This harbor is protected from the sea by a strip of sand which stretches westward from the aforesaid projection and bears the name of Isla Castilla, or Punta Arenas. This harbor receives the waters of two offsets of the San Juan river.

The earliest source of information that we feel warranted in using is the sketch to be found in Mr. Molina's work upon Costa Rica, which is based upon a survey by George Peacock in 1832, and has additions showing the progress of the sands of Isla Castilla down to 1848.

In 1832 five fathoms of water could be carried from sea to a point within the present basin of Greytown harbor, through an opening which measured $1\frac{3}{4}$ miles from Isla Castilla to the west shore. At that time the avenue to the sea was *without a bar*, and the regular decline of the bottom along the seaward channel-way gave no indications of the action of scouring forces. There was *no depression* at the harbor's mouth and no *accumulations* beyond, that seemed in any way to be a dependency upon the existence of the basin or its outlet. The shallow ground lying along the coast outside of Isla Castilla, and projecting beyond to the westward, would seem upon Mr. Molina's sketch to be a concomitant or parallel to this island as well as an outwork in the advance. Subsequent surveys, however, dissolve this apparent connection and relation.

The embouchure of the lower San Juan river is found in this first survey at the head of the anchorage basin, and the deposits of that stream appear to be nearly two miles within the harbor's mouth.

Between 1832 and 1834 a movement of the sands to the westward occurred, which extended the point of Isla Castilla about 456 feet per annum. This extension took the form of a hook. From 1834 to 1835 the point advanced 608 feet. Four years later, in 1839, it was found to have advanced 1,065 feet, or at the rate of 266 feet per annum. Between 1839 and 1840 it advanced about 400 feet. Between 1840 and 1848, a space of nearly eight years, it advanced 221 feet per year, and in the next succeeding 10 months 913 feet were

added, or the beach grew at the rate of nearly 1,100 feet per annum. The harbor as a protection to shipping had been improving up to the last date upon Mr. Molina's sketch, but its opening from the sea had become reduced to about 0.8 of a mile—a loss of over 50 per cent.

Our next authority is a chart issued by the hydrographic office of Great Britain, from surveys of 1853-'56 and 1859.

In 1853 we find the mouth of the harbor, measured on the same line as before, reduced to 0.52 of a mile—a reduction of 35 per cent. since 1848. In this period of $4\frac{1}{4}$ years, the sand-spit made an average annual advance of 401 feet. The physical character of the harbor had thus far undergone no change; the same good depth of water could be carried in; the same gradual decline of the bottom to seaward was preserved, and no bar or shoal lay in front. The point of Isla Castilla, called on this more recent map Punta Arenas, had been made across the floor of the sea by sands thrown in from above, not scoured from the bottom; it was built out like a mole, the material taking nearly its natural slope, and not suffering waste under the action of any currents from within. In this chart of 1853 an opening through the beach is found about at the extremity of the Castilla of 1832. As a physical feature it does not yet seem important.

The survey of 1856 found the dry portion of Point Arenas advanced nearly due south from its position in 1853, and a gradual shoaling off to the westward, reducing the harbor's mouth to 0.3 of a mile. At this time the point was broad and hooked. The same depth of water could be carried in as formerly, and no bar was found outside.

Between October, 1856, and January, 1859, two and a quarter years, Point Arenas advanced to the southwest 1,156 feet, or at the rate of about 514 feet per annum. Even as late as 1859, when the harbor's mouth was reduced to 0.13 of a mile, the only trace of any action from within was the retreat of the 18 feet line on the west shore.

According to a note upon the British chart the entrance was reduced to 300 feet in 1861; while in January, 1865, Captain Jones, of her Majesty's ship *Shannon*, reports "that the entrance has a bar across it after a norther, though after a continuance of fine weather the scour of the river increases the depth to 8 or 10 feet. The passage on the opposite side has also reduced to 50 or 60 yards."

Our final authority is the survey made under the direction of Captain P. C. F. West, who brought to the field the skill and accuracy of long experience in the Coast Survey, to which corps he belongs.

In this survey, made in February, 1865, the change in the physical character of the harbor, shadowed forth in the note that we quoted from the British chart, is confirmed. The anchorage basin has become a lagoon with an uncertain *inlet*. Between Point Arenas and the opposite shore a depression of 20 feet is found, to reach which $17\frac{1}{2}$ feet must be passed in the approach from the harbor, and eight feet in the approach from the sea. Here we have the *depression at the opening* and the *bar outside*, which are the characteristics of a true *inlet*, for which we have looked in vain upon the earlier charts.

The unsteady progress of Point Arenas since 1832 does not necessarily imply an irregularity in the action of the causes, nor a fluctuation in the supply of material. In an unpublished report by Henry L. Whiting, assistant in the Coast Survey, relative to the extension of Sandy Hook and the closing of Shrewsbury inlet, it is stated that the movement of the sands along the coast is often in horizontal curves or projections which advance like dunes, by the drifting of sands from rear to front, so that to an observer at any single point chosen upon the beach, the shore line will for a few months seem to creep out, then remain stationary for a while, then retrograde. In this case the movement from rear to front is in the *horizontal*, whereas in dunes it is in the *vertical* plane.

After the completion of the general survey, Captain West's party found in May that the opening at Greytown harbor had closed, and that a break had been made further to the westward.

Captain West says of this break, that "a channel opened when sufficient water had accumulated in the harbor, through the sand at the place marked on the sheet, which has remained open ever since, the water on the bar varying in depth as the river water varies in volume, (affected also by the action of the sea,) about five feet being the average." A letter from J. E. Hollenbeck, dated San Juan del Norte, 1st March, 1866, says of this break: "The inhabitants of this place were compelled to dig a channel through the sand bank to prevent the town from inundation, (the effect of the sea banking the sand up higher than the level of the town.) The channel cut by the inhabitants here was at first four feet wide and from four to eight feet deep, but in five days there was such a head of water accumulated after opening this small channel, in one night it cut an outlet to the sea, 80 yards wide and nine feet deep, and from this time to January, 1866, the channel varied just in proportion to the water in the river."

From Mr. Hollenbeck's statement it would appear that the sand beach went on increasing by the action of the sea after the harbor had closed.

It is not till we reach Captain West's survey that we detect any essential alteration in the depths of the central portion of the anchorage basin. The depths, 1832 to 1859, were four fathoms; in 1865, 22 feet. The material of the bottom is now soft black mud, no doubt vegetable mould and clay from the river, which, being suspensible, have been carried out beyond the delta and dropped in the still basin, to which is added fine sand blown in from Point Arenas.

The area of the anchorage basin bounded by the 18 feet curve, in 1853 was 385, in 1856 295, and in 1865 132 acres. In a period of 12 years it shrank to one-third of its former area.

Among the many interesting features which this new survey offers, we call attention to a lagoon lying to eastward of Greytown harbor and forming one of its interior basins, called Harbor Head. The central portion of this lagoon has 27 feet of water, and since from its position no scouring power now exists, or as we think ever could have existed from land waters, we are disposed to regard this basin as a bight which long ago went through the stages that we have traced in the maps of Greytown anchorage. We regret that we have no recent soundings along the outside shore in the vicinity of this Harbor Head. The question of a possible inlet to this deep basin we cannot discuss.

From information gathered from the reports and letters before us, it appears that the prevailing winds on the east coast of Nicaragua are from north round to east, *usually northeast*. These winds are unsteady in force, and at irregular intervals give place to calms and land breezes of short duration. Southeast winds occasionally occur. A glance at a map of the Carribbean sea shows that the maximum exposure, *i. e., the line of greatest fetch or reach of the sea*, is a little north of east. We may safely admit, then, in the absence of numerical data, the verbal statement made by Captain West that the roll of the sea upon the beach near Greytown is from the northeast.

The movement of sand extending to Point Arenas between 1832 and 1861, taken as a measure of the transporting power of waves, scarcely finds a parallel upon our own coast; but considering the prevalency of winds from seaward, this vast movement may be regarded as the effect of *persistent* rather than *violent* effort, the continual action of a breaking sea upon a lee shore. Moreover, a northeast roll of the sea is diagonal to the beach near Greytown, and by urging the sands forward in a narrow spit it has worked to great advantage to produce those particular effects best exhibited by comparative surveys.

If the sands of Point Arenas had moved directly before the waves from northeast, after the survey of 1832, there might still have been left a basin beyond the deltas of the San Juan river. The surveys show, however, that the beach has moved more to the westward, along the course of a resultant of two or more forces. The northeast swell may have experienced some reaction from

the beach or from the slope of the bottom, which, as a passive force added to the active one of outflowing land waters, may have been sufficient to effect the change in the resultant direction of the working power.

On the east shore of Sandy Hook a movement of the beach towards the point, under the action of waves, has been going on, which some have feared would close the main channel into New York harbor. For some years the outer beach, in the neighborhood of the fort, wasted under this action, and a commission of United States officers was appointed to advise upon the best mode of arresting the sands. As an experiment they recommended jetties, made of canal boats filled with concrete, placed normal to the shore line, and this experiment is now in progress.

Punta Arenas, like Sandy Hook, is extending, under the influence of forces which probably do not act at great depths. The outer ridge has moved but slowly to the westward, because, perhaps, it is rare that the waves materially agitate the bottom in 8 feet water in this place. On the outside of Sandy Hook the Coast Survey examined the action closely, and could not discover any movement beyond the depth of 8 feet at low water, except near the point. It must, however, be remarked that the shores of Sandy Hook, unlike those of Punta Arenas, are visited by derivative waves which approach from the south-east: the direct action of the ocean swell is not felt on this somewhat sheltered shore. The present works at Sandy Hook are regarded only as experiments, which are, perhaps, to be followed by operations on a larger scale. Upon Point Arenas heavier works would be required than at Sandy Hook, even, perhaps, for experimental objects.

Although the tide on the coast of Nicaragua is very small, (estimated by Captain West at 15 inches,) it may be made decidedly useful by opening every available receptacle above the anchorage basin. If there is usually a period of calm each day, the wind itself may be turned to account by the opening of these receiving basins; because the water, driven in by this superficial force and stored up till the calm, will escape as a more profound current and help to remove the sands from the bar.

In the course of time a bar will form inside as well as outside of the inlet, but there will be a basin of some extent between this and the inlet itself.

Satisfied in our own minds, from a diligent study of the case, that the original physical character of Greytown can never be restored, we are brought to the conclusion that the hope of its improvement must be based on those qualifications which the present lagoon may possess for becoming an *inlet harbor*.

Other things equal, the good depths of inlets seem to depend upon—

1. The relative direction of their outflow to the onset of the sea;
2. The amount of land water;
3. The amount of tide water.

If the outflow meets the onset of the sea directly, the power of the former to sweep away the sands is destroyed. The attempt to open an inlet, some years ago, at the eastern extremity of Fire Island, failed because of this antagonism. On the North Carolina coast the inlets north of Cape Hatteras are mostly closed by the northeast sea, while those south of this cape are good, because the outflow escapes somewhat in the trough of the sea.

Land waters, *i. e.*, the fresh water outflow, being a force constantly pressing *outward*, is an important element. In our lakes and in the *tideless* Mediterranean there are basins, formed by the drift of sand across the mouths of rivers, which have inlets admitting, in some instances, large vessels. Where the supply of water is large, but not rapid; where the river has a basin at its foot, or wanders through a low country before escaping to the sea, a better inlet is usually found. The stream is purged of its own sands and muds, and is able to remove the external barrier by persistent effort without casting about the material in abrupt masses. At the foot of rapid streams issuing upon the sea the most dangerous shoals are often found.

The evident dependence of the present inlet to Greytown basin upon the volume of backwater pressing seaward has disposed many intelligent persons associated with the Transit Company to attribute the original existence of this harbor to the outflows of the lower San Juan river, and to conceive that a gradual falling off of land waters has been the grand source of mischief from first to last.

This opinion, it will be apparent from the foregoing review of the case, is not well founded. The harbor, in fact, was formed by the building out of a sand-spit, under the action of the waves and currents of the sea, and the great depth of entrance was simply that of the sea-bottom on which the mole was forming; the regular slope of the bottom through the inlet showing that the river discharge had no material part in maintaining that depth.

Tide water has its chief value as an auxiliary force when land waters are supplied, although it is often useful when working alone. The ebb current is naturally convergent, and therefore stronger than the divergent flood. Moreover, the ebb current is the stronger, because the greatest efflux of water occurs on the falling, at a lower absolute level than upon the rising tide.

If tidal circulation is brought about by the existence of two avenues in proper relative position, more scour is effected.

The distinctive qualities of the ebb by which a predominance over the flood is effected, are dependent very much upon the *range* of the tide; although the velocities of tidal currents generally are not so dependent upon range as upon the *area of tidal basins*.

It is principally as an auxiliary force that a tide of small range can be useful. In the case of Mobile bay, a tide of only two feet, acting in concert with a small supply of fresh water, is able to maintain an inlet with 60 or 70 feet in the opening and 17 feet on the outer bar. The Alabama river is so low, in the dry season, that the tide rises and falls nearly 90 miles above this inlet, yet the bar undergoes but little change. The fresh waters, accumulating in the bay, act steadily and persistently, giving to the currents a resultant seaward power far out into the ocean. The flood currents and the river outflows neutralize each other for one half of the day, while the rising tide is damming in the accumulating land waters; but during the other half of the day ebb and river outflows act together; so that an *outward force* prevails every day of the year, although not every hour of the day. A grain of sand rolls so slowly under the action of a current, that we may, without essential error, regard all the forces of ebb and flood, for a single day, as simultaneous, and speak of this grain as moving along, the resultant of two forces.

Greytown harbor has an advantage of situation, since a channel may be cut through the sands which shall allow the escape of water somewhat in the trough of the sea. Its tide is of small range and its tidal reservoirs of small area. It can, however, be made the receptacle of considerable land water. Openings have formed naturally since the closing of the harbor by the advance of Point Arenas; and once, with small aid at the outset, a cut was executed by the outflow 16 to 18 feet deep and about 80 yards wide; and we learn that a bar formed outside, but with what ultimate depth upon it is unknown. There are many inlets upon our coast with 16 to 18 feet in the opening, which have bars as shallow as six feet upon the outside. The cut through Point Arenas which we have mentioned was insignificant, especially in its width, compared with those inlets which are usually regarded as navigable; still, as a measure of the working power of the river waters we consider it important, because we conceive that a navigable passage for small steamers might have been caused if the outflow had continued. Since the necessary supply of back-water can be afforded by the improvements of the river above, the question upon which the possibilities of a navigable inlet seem to rest is, whether the formation of a bar can be wholly or in part prevented. In the endeavor to answer this question we are carried back again to a comparison of our charts.

In first referring to the harbor as it existed in 1832, we alluded to the outer ridge of sand beyond Punta Arenas and parallel to it. Of the history of this bank between 1832 and 1853 we know nothing. The sketch of the survey of 1832 shows that it existed, but does not define its extreme limits. In 1853, its most western point was five-tenths of a mile from the west shore of the bight, and at this point the water was bold, falling off from 7 feet to 24, in this respect resembling Punta Arenas, which on the same date fell off from zero to 25 feet.

In 1856, the same point of this shoal was 0.4 of a mile from the opposite shore, and in 1865 but a trifle less than this.

As shown upon Captain West's survey, the outer ridge lies nearly parallel to the portion of Punta Arenas formed since 1832, and is about 450 yards from the latter.

Whether this ridge is joined to the coast further to the eastward or not, we have no means of positively knowing. If it is a new bight harbor in process of formation, its progress is very slow. There are no indications of shoaling upon it.

If a jettee were stretched from the east bank of the inlet of 1865 (as given upon Mr. West's map) to the outer ridge in a north-northwest direction it would serve three purposes.

1. The sands from the eastward would for a time be arrested, and when these had accumulated so as to go round the end of the pier, there are grounds for hope that for many years they might incline to stretch along the line of direction of the present ridge, instead of closing under the lee of the jettee itself.

2. It would protect the opening itself from the continual beat of the northeast sea in great measure, especially if, by artificially arming the opposite point of the outlet, the outflows can be confined and guided along a path close under the jettee.

3. The outflows would be guided by this pier across the channel now existing between the outer ridge and the beach, before making its principal deposits, and a way left open for steamers.

As a further expedient for arresting the westwardly movement of the sands now augmenting Point Arenas, we recommend the opening of an inlet or slueway at the extreme eastern limit of the harbor head, and the maintenance of this inlet as a means of cutting off the supply of sand from the more distant part of the coast. Mr. West informs us that he ascertained that in former times such an inlet existed, and this may account for the comparatively stationary condition of Punta Arenas for many years previous to 1832, just even as the existence of Shrewsbury inlet arrested the progress of Sandy Hook for many years.

The depth to be gained in this avenue must depend greatly upon the amount of land-water that can be supplied. If the discharge of the lower San Juan can be augmented so that it shall never fall below the present yield of the rainy season, the minimum depth of 11 feet may probably be secured. This minimum depth implies a depression at the outlet through the sands of not less than four fathoms; in other words, the sands would be swept away to the original floor of the sea, as found in our earliest surveys.

Before we proceed to point out the manner in which the outflow can be augmented, we must recommend the planting of the entire beach eastward of the jettee with grasses or quick-growing shrubbery that shall defend the sands from the action of the winds and overflows of the sea, which now cause in part the filling of the basin within. A notable instance of the efficacy of this mode of arresting the sands of an open shore is offered at Provincetown, Massachusetts, where beach-grasses were planted by the United States government some years since, with the same object that we now have in view. In the instance we cite, the results, though partial, are of great value, especially in arresting the movement of sands by the wind. We conceive that upon the Greytown beach, far more

than upon that at Provincetown, there must be a continual drift of its finer sands from the fore shore towards the basin.

We understand that the transit company have undertaken the closing of the Tauro, which has been a considerable drain of the lower San Juan, and we fully approve of this as an initiatory step in the increase of Greytown back-water.

We now proceed to consider in what manner the outflow through the lower San Juan river and the depth in its channel-way may be increased.

3. IMPROVEMENT OF THE LOWER SAN JUAN RIVER.

Nine miles in a direct line from the sea, the river San Juan bifurcates; one branch, 15 miles in length, retains the name of the Affluent, while the other, which really seems to be the continuation of the main stream, takes the name of the Colorado Outlet, (Boca de Colorado) and debouches upon the sea, through a break in the sands, about 16 miles to eastward of Greytown.

From the gaugings of Mr. Childs, Captain West, and Mr. Howard, we find that in the dry season the San Juan above the bifurcation discharged 22,528 cubic feet per second, of which 20,743 cubic feet (92 per cent.) passed out by way of the Colorado, and 1,785 cubic feet (eight per cent.) by way of the lower San Juan. Before reaching the Greytown basin, the lower San Juan loses 753 cubic feet which escape to the sea by the Tauro outlet, and receives re-enforcements from the San Juanillo to the amount of 458 cubic feet; so that the Greytown basin actually receives in the low-water months (winter) only 1,490 cubic feet per second.

In the wet season (in August) Mr. Childs found the discharge of the San Juan above its bifurcation 54,380 cubic feet, of which 42,056 (77 per cent) passed off by way of the Colorado, and 12,324 (23 per cent.) by way of the lower San Juan. We are not informed of the proportion carried to sea by the Tauro at this season, nor of the re-enforcements of the San Juanillo; we may, however, without great error, assume that the Greytown basin receives 12,000 cubic feet or nearly seven times this supply of the dry season. Mr. Baily, in his note upon the canalization of Nicaragua, gives the minimum discharge of Colorado 12,204, and the maximum 38,637, making the increase for the wet season threefold.

In order to give to the harbor of Greytown, in the dry season, the supply that it now has in the wet season, one-half of the low-water discharge of the Colorado must be reserved and compelled to pass down the lower San Juan. This proportion is very large, and the structures necessary to turn so great a volume of water from its chosen path must be of considerable magnitude and strength. We have not only to consider the means of controlling the outflows of the dry season, but to provide against the destructive effects of freshets.

We regard the bifurcation of the San Juan as the proper site for attempting these operations. The first step should be the dredging away of the bed of the lower San Juan in this neighborhood, so as to make it a more ample water-way; and after this a weir stretched from Leaf's island to Conception island might be expected to accomplish the diversion of water now escaping down the Colorado. With every disposition to enter at once upon the computation of the amount of dredging required and the requisite dimensions of the weir, we find ourselves wholly unable to entertain the problems for want of proper data. The chart of the bifurcation recently made by Captain West furnishes shore-lines, depths, areas of sections, and volumes of discharge for the dry season; but we have no measures of the surface slopes of the streams, nor information relative to the material of the river beds below their surfaces. We would not be understood to complain of this chart, which contains all that is usually required for navigation and more; but the desiderata that remain are indispensable elements for the engineer. Moreover, the conditions, however complete, for the dry season only, would not suffice; these for the high water

season are also requisite. No idea can be formed of the variations, absolute or relative, of these streams, in respect to capacity &c., from the work of one season. That we may be clearly understood and our wants appreciated, we shall offer a schedule of the elements required; and in doing this we shall suppose the area under observation to extend a half mile above and below Leaf's island, covering the three streams, San Juan, lower San Juan, and Colorado.

1. Average area and perimeter of section for each stream.
2. Surface slope of each stream determined by levellings among several gauges; three gauges in each case may suffice.
3. General slope of bed in each stream.
4. Average velocity of current from side to side, and from top to bottom, in each stream.
5. Material composing the bed of each stream, from borings to depth not exceeding 25 feet.

To these data may be added for other uses—

6. Percentage of material suspended by the water of each stream.
7. Size and specific weight of material swept along, or rolled upon the bed of each stream.

An essential point in the construction of the proposed weir is the crossing of the main channel. Unless the thread of the escaping stream is obstructed between Leaf's and Conception islands, little will be accomplished. In illustration of this we may recall the attempt, made some years ago, to compel the waters of the Alabama river to abandon the Spanish river outlet and pass down the Mobile. Jetties were stretched out from either bank of the Spanish river with the expectation that a reflux of water would be thus produced. As might have been expected, the stream made excavations near the jetties to restore its section, then passed on as before; no trace of increased scum in the Mobile river was ever detected.

The deepening that we have advised in the lower San Juan, in the neighborhood of the weir, may prove sufficient to improve the whole stream, since the great proportion of water added at the dry season and the considerable increase of the wet season discharge must act powerfully upon the bed of the stream, and increase its depth wherever a yielding bottom is found. It may, however, well be feared that this scour, induced along the bed of the stream, will sweep into the harbor-basin masses of material not so easily removed from the deeper water of the anchorage-ground as from their present positions.

It appears possible that the fate of Greytown harbor might have been averted by timely efforts to arrest the sands and cut off their supply. We do not say this in a spirit of vain regret, but rather with the hope that, as an example to communities along our own seaboard, this remarkable instance may not be lost. We have proposed improvements, but these must fall very far short of a renovation of the noble harbor that once welcomed to an ample and secure anchorage the largest ships that crossed the Caribbean sea. In the earnest desire to discover the means of affording relief to the commercial embarrassments of Nicaragua, as well as to further the interests of an enterprising transit company, we have spared no labor nor made haste to advocate projects unwarranted by experience.

4. COLORADO PASS AND RIVER.

We are called upon by our instructions to extend our inquiries to the mouth of the Colorado, and we have done so as far as the meagre data at our command would allow. No information based upon a reliable survey of the Colorado entrance, earlier than that furnished by Captain West, has come to our knowledge, and the survey which this officer caused to be made is of very limited extent, although it has every appearance of a faithful and minute survey as far as it goes.

The entrance to the Colorado, which bears the mixed character of a river embouchure and an inlet, is obstructed by an outside bar, which, at the date of Captain West's survey, had a direct channel-way over it of 11 to 12 feet.

That the Colorado bar is prone to shift its banks and channel during gales of wind, we should infer from its exposed position and its resemblance to several bars upon our own coast, of which we have had much experience. In recent letters from Greytown, which we have had before us, changes for the worse are stated to have taken place in the depths, &c., of this bar; but we are not able to judge of the accuracy of information which is not (apparently) based on regular surveys. Captain West's soundings are sufficiently numerous in the channel-way, and they were made in the dry season.

For any class of vessels which at any season cross the bar the most ample anchorage basins are offered, most of them having bold water along shore suitable for wharves.

If the Colorado were made the recipient of all the waters of the San Juan, by the closing of the lower San Juan, the San Juanillo, and other smaller offsets, an increase of the depth upon the bar, due to *increased* scour, would be likely to follow, although this is not a point of certainty. A survey made during the wet season, when the river outflow is large, would show, by comparison with Mr. West's chart, how much improvement could be counted upon.

To venture into projects of improvement for this entrance without knowing its history except for a single day, is more than we feel willing to undertake.

We recommend that a survey be made in the wet season, to ascertain the effect of increased outflows upon the bar channels.

RECAPITULATION.

First. Greytown harbor was originally a bight in the shore, formed by the drifting of sand from a projecting point or elbow of the coast, so as to partially enclose, or cut off, from the sea a basin. The same causes which formed this bight converted it at last into a lagoon. Into this lagoon the waters of the San Juan empty, and now escape from it to the sea by outlets whose capacity depends upon the amount of river outflow.

Second. The original bight of Greytown cannot be restored. The only hope of improvement rests upon the possibility of maintaining a navigable outlet from the present lagoon by increasing the outflow of the lower San Juan and arresting the drifting sand of the coast.

Third. The works necessary to arrest the drifting sand, and those necessary to turn into the lower San Juan a larger supply of land waters, are costly.

It is impracticable to form a correct estimate of their cost without having possession of certain additional data, the nature of which is specified in the preceding report.

Fourth. The basin of Greytown, where ships formerly lay at anchor, has been largely reduced in size and depth by the advance of the river delta upon the one side and the drifting in of sand on the other. The time is not very distant at which the river will debouch directly upon the sea.

It will be necessary to maintain a sufficient anchorage basin by means of dredging.

Fifth. The Colorado pass, at the date of the last regular survey, had a depth of 11 feet over its bar; but further survey and examination are necessary before the character of this entrance, or the means of improving it, can be discussed.

Sixth. The Colorado, unlike the lower San Juan, is a navigable stream at all seasons for steamboats.

A. A. HUMPHREYS,
C. H. DAVIS,
J. E. HILGARD,
HENRY MITCHELL,

Committee of the National Academy of Sciences.

APPENDIX.

AUTHORITIES CONSULTED BY THE COMMITTEE.

PUBLISHED MATTER.

Notice sur la navigation transatlantique des paquebots interocéaniques, on recherches sur les routes de plus court trajet d' Europe à Saint Jean de Nicaragua et retour, et sur régime des courants, des vents, et des tempêtes dans l'océan Atlantique septentrional. Par F. A. E. Keller, ingénieur hydrographe de la marine. 1859.

Note pour servir à la canalisation du lac Nicaragua. Par M. Baily, ingénieur anglais. 1844.

Percement de l'Isthme de Panama par le canal de Nicaragua. Exposé de la question. Par M. Felix Belly. 1858.

Map and profile of the route for the construction of a ship canal from the Atlantic to the Pacific oceans, across the isthmus in the state of Nicaragua, Central America. Surveyed for the American Atlantic and Pacific Ship Canal Company by O. W. Childs. 1850-51.

Tigre island and Central America. Ex. Doc. No. 75; 31st Congress, 1st session. 1850.

Bosquejo de la republica de Costa Rica seguido de apuntamientos para su historia. Con varios mapas, vistas y retratos. Par Felipe Molina. 1851.

Memoir on the boundary question pending between the republic of Costa Rica and the state of Nicaragua. By F. Molina, envoy extraordinary and minister plenipotentiary of Costa Rica to the government of the United States. 1851.

Treaty of territorial boundaries between Nicaragua and Costa Rica; concluded and signed on the 15th of April, 1858.

[No title.] Contract between the government of Nicaragua and the Central American Transit Company, dated Washington, November 10, 1863.

British admiralty charts of Greytown harbor.

MANUSCRIPT.

Report and estimate of Preston C. F. West, chief engineer of Nicaragua, to Francis Morris, esq., president of the Central American Transit Company. Washington, September 4, 1865. With 13 maps.

Report of Sonnenstein, engineer, to W. H. Webb, president of the Nicaragua Transit Company. San Juan del Norte, February 20, 1866.

Extract from a letter from D. S. Howard, engineer, dated Greytown, May 12, 1866.

Copy of report of D. S. Howard, engineer, to W. H. Webb, president, &c., dated Greytown, May 27, 1866.

Copy of a letter from W. H. Webb, president, &c., to Don Luis Molina, minister of Nicaragua, dated New York, July 18, 1866.

Copy of a letter from J. E. Hollenback to Messrs. Stout Brothers, dated San Juan del Norte, March 1, 1866.

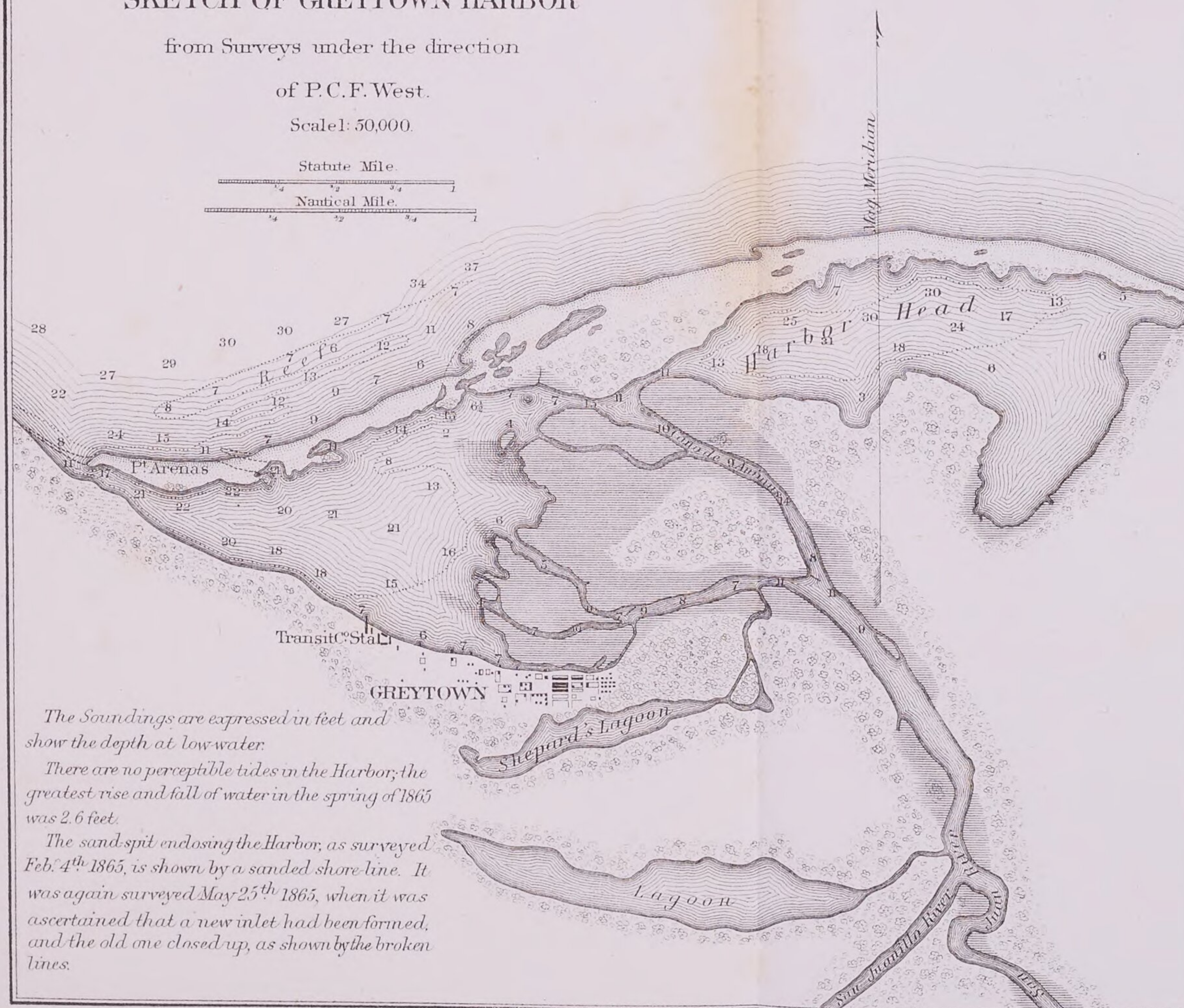
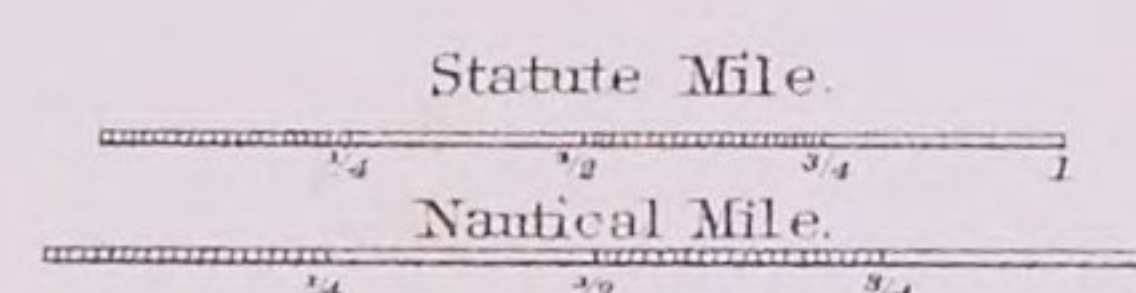
Communication from Don Luis Molina, minister of Nicaragua, addressed to the Secretary of State of the United States, dated Washington, June 9, 1866.

SKETCH OF GREYTOWN HARBOR

from Surveys under the direction

of P. C. F. West.

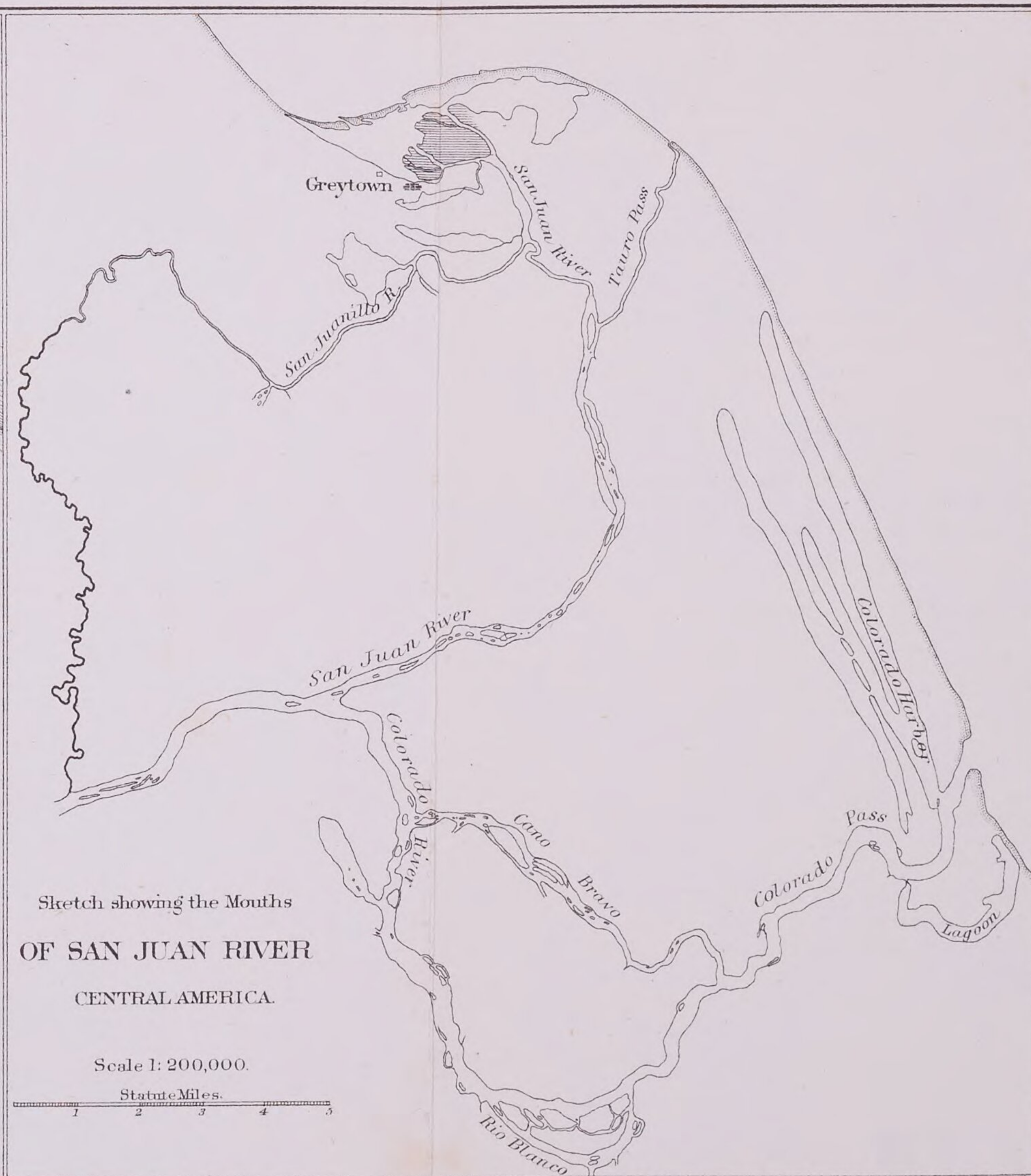
Scale: 50,000.



The Soundings are expressed in feet and show the depth at low water.

There are no perceptible tides in the Harbor; the greatest rise and fall of water in the spring of 1865 was 2.6 feet.

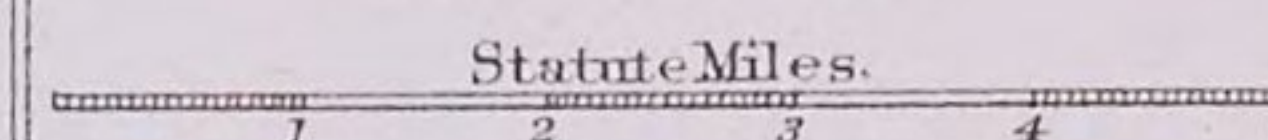
The sand-spit enclosing the Harbor, as surveyed Feb. 4th 1865, is shown by a sanded shore-line. It was again surveyed May 25th 1865, when it was ascertained that a new inlet had been formed, and the old one closed up, as shown by the broken lines.



Sketch showing the Mouths OF SAN JUAN RIVER

CENTRAL AMERICA.

Scale 1: 200,000.



STATE OF CALIFORNIA

County of _____

APPENDIX II.

QUARTERMASTER GENERAL'S OFFICE,
Washington, D. C., January 8, 1867.

SIR: It having been suggested to the War Department that the coating with zinc of the iron head-blocks, with which it is proposed to mark soldiers' graves, will produce galvanic action that will tend to a destruction of the iron blocks, the Secretary of War has directed me to submit the subject to the Academy of Sciences here, with a view to obtain an intelligent opinion on it, and to ascertain if there be any good ground for the apprehension.

In obedience to this direction, I respectfully submit the subject to you with a request that you will present it to the Academy of Sciences and advise me of their opinion thereon, that I may make report thereof to the Secretary of War.

I am, very respectfully, your obedient servant,

D. H. RUCKER,
Acting Quartermaster General, Brevet Major General.

The PRESIDENT OF THE ACADEMY OF SCIENCES,
Washington, D. C.

NATIONAL ACADEMY OF SCIENCES,
Washington, January 17, 1867.

SIR: In compliance with your request, the undersigned, a committee of the National Academy, appointed to examine the proposed cast-iron head-blocks for soldiers' graves, and state whether, in their opinion, the coating of zinc will tend to produce a galvanic action destructive to the iron, respectfully report as follows:

The head-block submitted to the committee is a hollow truncated pyramid of cast iron, on one side of which, in raised figures, is the No. 12,646, and on the top, also in raised letters, the name of a soldier, his regiment, and a date, probably that of his death. This block is entirely covered inside and out with a coating of zinc, of greater thickness on the surface containing the letters and figures.

From well-established principles of galvanism, and from the direct experiments of the committee, it is certain that while the zinc coating covers every part of the surface of the iron, no other galvanic action will take place than that exhibited in the ordinary corroding of a single metal, but that as soon as the smallest portion of the iron is exposed to the liquid precipitation from the atmosphere, a galvanic current will be established passing through the liquid from the zinc to the iron, that the former will be more rapidly corroded than it was previous to the exposure of the iron, and that this action will go on until all the zinc is dissolved. The iron, during the process, will be protected from the action of the atmosphere at the expense of the zinc. After all the zinc has been dissolved, the iron, being unprotected, will then be corroded in the usual manner.

From this statement it is evident that the coating of zinc will tend to prolong the existence of the iron in its metallic state, though it will not afford a perpetual protection such as may be given by a coating of enamel like that used in covering the basins of iron sinks, kettles, &c.

The experiment made by the committee consisted in attaching to one end of the wire of a galvanometer a plate of zinc and to the other end a plate of iron. These two plunged in a vessel of water slightly acidulated by sulphuric acid, gave rise to a powerful current of galvanism from the zinc to the iron. While the zinc was rapidly corroded the iron remained unaffected. By substituting

for the zinc a plate of copper, a still more powerful current was produced in the opposite direction. The iron in this case was violently acted upon, while the copper retained its brightness.

The committee may state, as a general rule, that when two different metals are placed in metallic contact, the one most readily acted on by an acid will be dissolved, while the other will be protected, and that the action on the metal dissolved will be increased in intensity by the association. Thus, iron in association with zinc is protected, while the same metal in connection with copper is more rapidly corroded than it is without such connection.

Respectfully submitted.

JOSEPH HENRY.
J. H. C. COFFIN.
JOSEPH SAXTON.

General D. H. RUCKER, U. S. A.,
Acting Quartermaster General.

APPENDIX III.

Report of the committee on methods of inspecting and assessing tax on distilled spirits.

TREASURY DEPARTMENT, *February 15, 1866.*

SIR: I have the honor to request that a committee of the National Academy of Sciences be appointed to report to this department on the best method of proving and gauging alcoholic liquors, with a view to the establishment of such rules and regulations as may be necessary to insure a uniform system of inspection of spirits subject to duties.

Very respectfully,

H. McCULLOCH,
Secretary of the Treasury.

Professor JOSEPH HENRY,
Vice-President of the National Academy of Sciences.

REPORT.

The subjects of inquiry presented to this committee are twofold. The first branch, relating to the best mode of proving and gauging distilled spirits subject to duty, has been fully considered; conclusions have been reached and adopted by the department. The second branch, relating to the means of preventing fraud in collecting the revenue on distilled spirits, is still under consideration, as the most promising inventions have only been submitted at a recent date. The present report will, therefore, only cover the first branch of the subject; the remainder being reserved for a future report. In considering the subject of hydrometers the committee have, in the first instance, reviewed the existing regulations and practice; next have sought to discover the grounds of their insufficiency under the new circumstances arising from the high tax upon distilled spirits; and finally have endeavored to devise means to meet the exigencies of the case.

Previous to the imposition of the internal revenue tax imported spirits only were subject to duty. The instruments used in ascertaining their value were adopted upon the recommendation of Professor A. D. Bache, accompanying a report of investigations made under his direction by Professor R. S. McCulloch

on the subject of alcoholometers. This report, dated May 26, 1848, contains an exhaustive review of the scientific investigations and practical methods in all countries up to that time. It was printed as a public document, (30th Congress, 1st session, Senate Ex. Doc. No. 50,) and, together with the tables printed in a subsequent document, (31st Congress, 2d session, Senate Ex. Doc. No. 28,) forms a most valuable manual of reference for the subject under consideration. The recommendations made by Professor Bache were as follows:

1. That the strength of liquors should not be referred to the arbitrary degrees of an artificial system, as those of Dycas's hydrometer, but be expressed in per centums of alcohol contained by volume.

2. That no reference be made in terms of "proof," as "first proof," "second proof," &c., which are from legal enactment, and not commercial use, in ascertaining or describing the strengths of alcoholic liquors; but that such description be made in per centum by volume of contained alcohol.

3. That all gaugings or measurements of alcoholic liquids be referred to the standard temperature of 60° of Fahrenheit's thermometer.

4. That in stating the per centum by volume of pure alcohol contained in a liquid, it be reduced to its equivalent at the same standard temperature of 60° Fahrenheit.

5. That the centesimal hydrometer be adopted in determining the strength of liquids; and provisionally, until a better instrument is furnished, the centesimal alcoholometer of Tralles be used, with a suitable manual of tables to accompany the instrument.

The experience of the past fifteen years has fully proved the wisdom of the system then adopted, which has been found well adapted to the purposes for which it was intended.

The Tralles hydrometer was used not only by the government inspectors, but gradually found its way into use among importers of liquors, and in first-class distilleries. When, however, it became necessary to inspect and ascertain the strength of all the spirits distilled in the country, under a system of very high taxation, various objections were raised to its use. The principal ones are the following:

- (1.) The nonconformity of its scale with the custom of the trade. The Tralles instrument shows the per cents. of *alcohol* in the given sample of spirits, while all liquors are bought and sold by their percentage of *proof spirits*; and although the former are readily converted into the latter, when their relation is fixed, and especially when that relation is so simple as to define proof spirit to contain one-half its volume of alcohol, yet it was claimed to be desirable that the inspector's brand should correspond to the commercial designation of the article. Moreover, the duty being laid on proof spirit, an instrument showing per cents. of that liquor would lessen the labors of the inspector.

- (2.) The high rate of duty, amounting to six or eight times the value of the raw spirits, required that their value should be ascertained to within one per cent. In order to give single per cents on proof spirit, it would be necessary to observe and take into account half per cents of the Tralles instrument. This would require closer observation than there is usually time and opportunity for, while the use of fractions would materially increase the work of computation.

- (3.) The circumstances under which the inspection of large lots of liquor has to be performed, on the occasion of their shipment or delivery for storage at the government warehouses, are such as to render quite impracticable the use of instruments requiring great care in handling, and a certain degree of leisure in observation. It is often necessary to perform the inspection in the open air, exposed to inclement weather, and the greatest practicable despatch is generally requisite. Under such conditions, the length of the Tralles instrument, the care required in reading it to half degrees under the surface of the liquid, and the effect of the wind upon the exposed part of the stem, were found to be very objectionable. The further lengthening of the stem with the view of expanding the scale would, for these reasons, be quite out of the question.

(4.) It was found that the "Manual for Inspectors of Spirits" [McCulloh's] gives, for temperatures varying considerably from 60° *Fahr.*, sensibly erroneous values for the true equivalents to the indications of the hydrometer. There is, in fact, a systematic error in those tables the origin of which the committee have been unable to trace. Professor McCulloh, in the second report, above referred to, gives in full the data from which the tables in the Manual are derived, and states with great precision the processes of computation, which are perfectly correct. But the figures in the Manual do not correspond to those data and processes, and their error is attested by direct experiment. Thus, according to the fundamental data, an indication by the hydrometer of 50 per cent. at a temperature of 30° *Fahr.* corresponds to 55.94 *true per cent.*, while the Manual gives 57.22; and for the same indication at 100° *Fahr.* the true equivalent is 41.33, while the Manual gives 42.96.

The foregoing considerations led the committee to admit the necessity of adopting a more convenient instrument and providing correcter tables.

With a view to ascertaining the wants of the public in this matter, the opinions of several experienced inspectors were heard, among whose number the committee are specially indebted to Inspector G. W. Guysé for clear and practical information. One of the committee also conferred with leading distillers and rectifiers of spirits, as well as with revenue officers in different cities.

The general opinion was found to be in favor of adapting the scale of the new hydrometer to the custom of the trade, according to which the strength of spirits is reckoned *above* and *below proof*, in degrees intended to represent per cents. A few persons who had become used to the Tralles hydrometer, and learned the convenience of not having to deal with negative quantities, gave the preference to that instrument.

Upon general considerations it would seem desirable that one instrument should be used for the ascertainment of specific gravities of all liquids, *such as spirits, acids, oils, &c.*, the corresponding values of which would be inferred by reference to tables. It is apparent, however, that such an instrument would not be as convenient for the several trades, who each deal with one class of liquid only, as separate instruments for the use of each, giving as direct an indication of the value as practicable. Admitting that the government inspection should conform to the customs of trade, so far as consistent with correct scientific principles, the idea of introducing a universal *aerometer*, or specific gravity instrument, must be dismissed, although it is doubtless admirably adapted for a laboratory.

Having determined to adhere to the use of some instrument expressly adapted to alcoholic spirits, the first question to be decided was whether *alcohol* or *proof spirit* should be the standard of reference. It certainly appears more natural to estimate the value of a liquid by the quantity of that element contained in it which constitutes its valuable property. But when, as in this case, the price is habitually referred to a certain mixture of the elements which is the most common form of the product, while the valuable element is attainable in purity only by elaborate and expensive chemical processes, the committee see no difficulty in yielding to the general custom and adopting proof-spirit as the standard. There is no sacrifice of scientific precision when the relation of this standard to standard alcohol is positively defined. The cases in which it becomes desirable to convert the per cents of proof-spirit into per cents of alcohol are very few in number compared with those in which the reverse process would be necessary, if in the inspection of spirits alcohol were referred to as the standard, since, in fact, such would be the case with the branding of every barrel.

Proof-spirit has been heretofore defined by law to be alcoholic liquor, containing 50 per cent. by volume of alcohol, according to the Tralles hydrometer. The committee have seen no reason to make a change in the specific gravity of the alcohol to be considered as standard, but have followed Bache and McCulloh

in adopting Tralles' specific gravity of .7939 at 60° Fahrenheit. More recent experiments have indeed rendered it quite probable that *absolute* alcohol is yet sensibly lighter; but since that point remains still unsettled, and the possible difference is far within the limits of practical testing, and since prices have long adapted themselves to the Tralles standard of strength, any change has appeared inexpedient.

In order, however, to free the definition of proof-spirit from reference to a particular instrument, the committee, under date of April 19, 1866, recommended to the department the following provision of law, which was embodied in the tax law, providing at the same time for the adoption of other results of their inquiries, viz:

That proof spirit shall be held and taken to be that alcoholic liquor which contains one-half its volume of alcohol of a specific gravity of .7939 at 60° Fahrenheit, and the duties on all spirits shall be levied according to their equivalent in proof spirit; and the Secretary of the Treasury is hereby authorized to adopt, procure and prescribe for use, such hydrometers, weighing, and gauging instruments, meters, or other means for ascertaining the strength and quantity of spirits subject to tax, and to prescribe such rules and regulations as he may deem necessary to insure a uniform and correct system of inspection, weighing, and gauging of spirits, subject to tax throughout the United States.

The specific gravity of proof spirit thus defined, has been found by the experiments of Gilpin and Blagden to be .93353 at 60° Fahrenheit; water at its maximum density being taken as unity.

FORM OF HYDROMETERS.

The standard of proof being thus fixed, it was next decided that the hydrometer scale should be so marked and numbered as to show at the temperature of 60° Fahrenheit the equivalent of proof-spirit contained in the sample tested, indicated in per cents. by volume. Thus, proof-spirit would be indicated by 100; 40 per cent. over proof, by 140; standard alcohol, by 200; 20 per cent. below proof, by 80. This was deemed preferable to the employment of the negative scale under-proof, because it would simplify calculations and remove a fruitful source of mistakes in the application of the subtractive temperature corrections to negative quantities. The practical gaugers consulted readily assented to this proposition. As it was desired that the scale of the instruments should be so open as to indicate the nearest whole per cent. so decidedly that two different observers working hastily might not differ in their readings by so much as one per cent., it was agreed that the average length of a scale division should be about one-tenth of an inch for the range between 80 and 180 per cent., those being the strengths which occur in practice. It appeared, moreover, advisable, from considerations of practical conveniences, that the cup for containing the sample should not exceed seven or eight inches in height. Hence it was determined that a series of hydrometers should be provided, embracing together the entire scale, and so adapted to the ordinary classes of spirits that in proving a particular lot of barrels the inspector would require to use only one of the instruments. The scale was divided therefore as follows:

1. From 80 per cent. to 120 per cent. for proof spirits and whiskies.
2. From 100 per cent. to 140 per cent. for ordinary high-wines.
3. From 130 per cent. to 170 per cent. for extra high-wines.
4. From 160 per cent. to 200 per cent. for alcohols.

To these was added a fifth instrument giving the per cents from 0 to 100, or from water to proof-spirit, for the sake of completeness, and for occasional use with low-wines.

The set of hydrometers adopted are figured on plate 1.

A great variety of the hydrometers in common use were examined by the committee, most of these being of silver or brass, with spheroidal bulbs, and two or more scales on the stem, with corresponding weights to be attached

to the bulb when used in denser spirits. Such forms of construction were deemed to be objectionable for standard instruments, on account of their liability to become erroneous, by accident or designs by indentation of the bulb or alteration of the weights. A hydrometer of glass, sufficiently strong to bear ordinary handling, but which will break by a blow or fall, that would change the form of one of metal, was deemed far safer.

The committee next considered the question whether the thermometer should be blown into the bulb, as in Greiver's alcoholometer, or whether it should be attached to the can or cup in which the liquor is tested, as commonly used. The latter form was deemed preferable, as the former would greatly increase the cost and fragility of the hydrometers.

The glass vessel for holding the spirit, as used with Greiver's instrument, affords the means of reading the scale very accurately by looking at it through the glass below the meniscus formed by capillary attraction. It may be well doubted, however, whether under the ordinary circumstances of practice the inspectors would use the care and deliberation requisite in making the observation in that form. Besides, the fragility of the glass vessel forms a serious objection to its use. The committee have therefore given the preference to the ordinary copper can, eight inches in height, two inches in diameter, with a thermometer so attached as to have the bulb in contact with the liquid, and to be protected from injury by projecting rims of metal. This can should always be quite full when the hydrometer is immersed in the liquid, so that the reading can be taken with the eye nearly in the surface-plane of the liquid.

For the loading of the bulb, a method proposed by Mr. G. Tagliabue, of New York, was approved by the committee. It consists of the requisite weight of fusible metal placed in the bottom of the bulb, and fused there into a closely fitting button. This is very compact and strong, and avoids the narrow neck of the bulb filled with mercury or shot, common in other forms of glass hydrometers.

The form of hydrometers being thus determined upon, the next step was to establish the scales for the same. The following table gives the densities of alcoholic spirits for every per cent. of alcohol contained in the mixture, by volume, reckoned upon the volume of the mixture of alcohol and water. This table is derived from the experiments of Gilpin and Blagden, and is more generally known as Tralles' alcohol scale. The densities are referred to water at its maximum density—about 39.4° Fahrenheit—as unity; hence that of 0 per cent., or water, is given as .99910, that being its density at 60° Fahrenheit, the standard temperature of the table. The length of the part of the stem immersed is likewise given, being counted from the point at which the hydrometer floats in water of maximum density. The figures are derived as follows.—

Since the product of the volume immersed into the density of the liquid is always constant, the immersed volume is inversely proportional to the density. The numbers in the table, therefore, are the reciprocals of the densities diminished by unity, which is assumed to be the volume immersed in water.

Specific gravity of alcoholic spirits at 60° Fahrenheit, that of water at its greatest density being 100,000, and corresponding hydrometer scale.

Per cent. of alco- hol.	Specific gravity at 60°.	Length of immersed part of the stem.	Per cent. of alco- hol.	Specific gravity at 60°.	Length of immersed part of the stem.	Per cent. of alco- hol.	Specific gravity at 60°.	Length of immersed part of the stem.
0	.99910	9	34	.95963	420	68	.89415	1184
1	.99768	24	35	.95829	435	69	.89174	1214
2	.99626	38	36	.95693	450	70	.88923	1246
3	.99484	52	37	.95549	465	71	.88673	1278
4	.99342	66	38	.95406	481	72	.88420	1310
5	.99200	81	39	.95256	498	73	.88168	1342
6	.99071	94	40	.95106	515	74	.87911	1375
7	.98947	107	41	.94946	532	75	.87651	1409
8	.98822	119	42	.94784	550	76	.87388	1443
9	.98698	133	43	.94616	569	77	.87122	1478
10	.98572	145	44	.94447	588	78	.86855	1514
11	.98463	156	45	.94274	608	79	.86581	1550
12	.98353	168	46	.94098	628	80	.86306	1587
13	.98242	179	47	.93918	648	81	.86027	1624
14	.98132	191	48	.93731	669	82	.85743	1662
15	.98026	202	49	.93543	690	83	.85458	1701
16	.97923	212	50	.93353	712	84	.85168	1741
17	.97819	224	51	.93161	734	85	.84874	1782
18	.97716	234	52	.92959	758	86	.84580	1823
19	.97614	245	53	.92756	781	87	.84271	1867
20	.97512	255	54	.92552	805	88	.83955	1910
21	.97410	266	55	.92344	829	89	.83640	1956
22	.97308	277	56	.92134	854	90	.83310	2003
23	.97205	288	57	.91921	879	91	.82971	2052
24	.97103	299	58	.91705	905	92	.82632	2102
25	.97000	309	59	.91487	931	93	.81274	2155
26	.96894	321	60	.91264	957	94	.81907	2209
27	.96787	332	61	.91040	984	95	.81525	2266
28	.96680	343	62	.90815	1011	96	.81117	2327
29	.96568	355	63	.90589	1039	97	.80703	2391
30	.96454	368	64	.90360	1067	98	.80284	2456
31	.96339	380	65	.90130	1095	99	.79846	2524
32	.96215	393	66	.89894	1125	100	.79390	2596
33	.96092	407	67	.89656	1154	-----	-----	-----

The scale given in the preceding table holds good, proportionally, for whatever length of scale be employed, and for all parts of scales. To find, therefore, the graduation of the stem for the hydrometer, indicating from 50 to 70 per cent. alcohol, or from 100 to 140 per cent. proof spirit, we take the difference between 712 and 1246, the corresponding parts in the table, giving 534 parts to divide on the scale, in the proportion indicated by the table. If the whole length of this scale is to be 5.34 inches, every part will be represented by one-hundredth of an inch.

In the manufacture of glass hydrometers it is not practicable to obtain the scale of a given length; the graduation, therefore, is usually made by hand. In order to avoid this laborious and inaccurate process, a series of fifteen scales were engraved and printed for each one of the five instruments, ranging from 4 inches to 4.7 inches in length, within which limits it was found easy to keep the variation. After "pointing" each stem, or marking on it the extreme readings, by comparison with a standard instrument floating in the same liquid, that scale was selected which, among the fifteen, most nearly had the required length. In this manner no error greater than one-quarter of one per cent. could be introduced, which is quite inappreciable in practice.

In order to find the diameter of the stem which will give a certain length of scale between given per cents, we may proceed as follows: Let g and g' represent the specific gravities of the given per cents, V and V' the immersed volumes of the hydrometer; since in each case the weight of the displaced liquid is equal to the weight of the hydrometer, we always have $Vg = V'g'$. Thus, for a hydrometer indicating from proof to 140 per cent. we have, from the preceding table—

Specific gravity of proof spirit, .93353 = g .

Specific gravity of 140 per cent., .88923 = g' .

If we assume the immersed volume to be 2.65 cubic inches for proof, then we find $V' = 2.782$; hence, the volume of the stem immersed in g' is $2.782 - 2.65$ cubic inches; and if we make the length of the stem immersed between g and g' 4 inches, its diameter will be found .20 inch, nearly.

It is convenient to state, in this connection, the measures taken for securing accuracy in the manufacture of the hydrometers ordered by the Treasury Department upon the recommendation of the committee, and for their verification before acceptance by the department.

Dr. John Torrey and Dr. F. A. P. Barnard, members resident in New York, prepared, with great precision, standard mixtures of the specific gravities corresponding to the extreme and middle points of the proposed scales, and by immersion in those mixtures marked a series of very delicate floats, having large bulbs and thin stems, one for each mixture. These floats were used by Mr. Tagliabue to point the hydrometers he manufactured for the department.

Similar mixtures were prepared in Washington, by Dr. B. F. Craig, for the Office of Weights and Measures, when, under the direction of Mr. Hilgard, the hydrometers were tested for the department. It will be understood that such mixtures would not long maintain their strength after exposure to the air, and that they were only used for the selection of some sets of standard hydrometers, with which others were afterwards compared in mixtures of convenient strength.

It is gratifying to state that of several thousand instruments inspected, only very few were found to be in error over one-half per cent., and those mostly by several degrees, owing to some slipping of the scale or other accident.

MANUAL OF TABLES FOR TEMPERATURE CORRECTION.

In the preparation of the manual of tables which accompanies the hydrometers the experiments made by Gilpin and Blagden for the British government formed the principal basis of the work, as they are that of the tables of Tralles and of Bache and McCulloh, previously quoted.

The computations made by McCulloh have been verified throughout, and have received some corrections, especially in the interpolated parts between 93 and 100 per cent.

The extension of the tables from 30° to 20° temperature was rejected because it was thought necessary to give the corrections for temperatures as low as zero of Fahrenheit's scale, which would render additional experimental data indispensable, as Gilpin's experiments were not extended below 30° . The committee was informed by inspectors that it frequently happened that spirits arriving during winter in Chicago or Buffalo, and requiring to be inspected in bond, were found to be of a temperature approaching zero.

With a view to obtaining the requisite experimental data, the Treasury Department, at the suggestion of your committee, requested the Surgeon General of the United States to cause such observations to be made at his laboratory in Washington city, where special facilities for the purpose were understood to exist. Before these experiments could be made, the committee became acquainted with the labors of Dr. Recknagel, expressly undertaken with a view to supply the want in alcoholometry above stated, and published in the Pro-

ceedings of the Munich Academy of Science, for 1866. The results of Dr. Recknagel are fully confirmed by those subsequently obtained by Dr. Craig in the laboratory of the Surgeon General's office.

The appended tables are the following:

Table I gives the densities found by Gilpin and Blagden for spirits of different strengths, at temperatures varying from 30° to 80° Fahrenheit. The spirit used in these experiments has a density of 0.825 at 60° Fahrenheit; referred to water at that temperature as unity. It corresponds to 92.6 per cent. of the standard adopted by Tralles. The table also gives the corresponding per cents by volume according to Bache and McCulloh.

Table II gives Gilpin and Blagden's densities, corrected per errors of observation by the methods of curves and least squares, according to Bache and McCulloh, and reduced to the standard of Tralles.

Table III, derived from the preceding, shows the true densities and volumes of alcohol of every strength from 1 to 100 per cent., and for every five degrees of temperature from 30° to 100° . The portion of this table above temperature 80° is derived from the other part by interpolation with second differences, as fully stated by McCulloh *l. c.*, and the extension of the densities from 93 to 100 per cent. is derived from a comparison of the observations by Gay Lussac, Delegennes, Tralles, Muncke, and McCulloh. The supplement to Table III gives the specific gravities of spirits between temperatures 0° and 25° Fahrenheit, from the observations by Dr. Recknagel, reduced to the standard of Tralles.

Table IV, derived from the preceding one, shows the apparent densities, for glass vessels or hydrometers, and the apparent per cents, for every true per cent. and for every fifth degree of temperature from 30° to 100° . By *apparent per cents* is meant the per cents indicated by a glass hydrometer, which is graduated to show true per cents, when the spirit is at a temperature of 60° Fahrenheit. These indicated or apparent per cents are obtained from a table of densities at 60° , interpolated for tenths of a per cent., the apparent specific gravities for each true per cent. being used as arguments. The supplement to Table IV finally contains the same data for temperatures between 0° and 25° , and for spirits between 30 and 100 per cent., from Recknagel's experiments.

This table furnishes us with the data required for practical use in alcoholometry, viz: a comparison between the true and indicated per cents. The argument, however, is the true per cent., which appears in integer numbers, while the corresponding indicated per cents are fractional. We require, on the contrary, for the Manual, a table in which the indicated per cents are the integer argument, as observed on the hydrometer.

The surest mode of effecting the required interpolation, and best calculated to provide a check against all preceding errors, was deemed to be the graphic method, on a sufficiently large scale to make hundredths of one per cent. sensible and tenths certain.

Plate No. 2 shows the scheme of projected sheets on one-tenth their actual scale, and exhibits at the same time the general law. Plate No. 3 gives one of the sheets on the full scale, and is intended to illustrate the process. It is by this means that Table I of the Manual has been constructed. Tables II and III of the same are based upon the same experimental data as heretofore detailed. The computations and graphic operations have been mainly performed by Mr. F. Hudson; those for temperatures below 30° by Mr. F. H. Agnew; both of whom are entitled to great praise for the accuracy of their work.

The following table, computed by Mr. Hudson, will be found of value, giving the relations between the per cents by weight and by volume, and the actual quantities of water and alcohol contained in determinate mixtures by weight. It will be borne in mind that when alcohol and water are mixed a contraction takes place, varying with different proportions. Thus it requires 50 volumes

of alcohol and 53.67 volumes of water to produce 100 volumes of proof-spirit. The weight of 100 gallons of water at 60° Fahrenheit is taken at 833.14 pounds avoirdupois.

Table of per centage by weight and volume, and of weights of alcohol and water in 100 gallons of spirit at 60° Fahrenheit.

Per cent.		Water by volume.	Specific gravity of spirit. (Water at 60° = 1.)	Weight of alcohol in 100 gallons spirit.	Weight of water in 100 gallons spirit.	Weight of 100 gallons of spirit.
Alcohol.						
By weight.	By volume.					
5	6.24	94.17	0.99131	<i>Pounds.</i> 41.29	<i>Pounds.</i> 784.61	<i>Pounds.</i> 825.90
10	12.38	88.56	.98398	81.98	737.81	819.79
15	18.45	83.09	.97758	122.17	692.29	814.46
20	24.45	77.72	.97144	161.85	647.50	809.35
25	30.36	72.38	.96500	200.99	602.99	803.98
30	36.15	67.03	0.95757	239.34	558.45	797.79
35	41.80	61.69	.94901	276.73	513.93	790.66
40	47.29	56.37	.93948	313.08	469.63	782.72
45	52.62	51.10	.92916	348.35	425.77	774.12
50	57.78	45.92	.91833	382.55	382.55	765.10
55	62.79	40.82	0.90718	415.69	340.12	755.81
60	67.64	35.83	.89582	447.80	298.54	746.34
65	72.33	30.95	.88416	478.81	257.82	736.63
70	76.85	26.17	.87240	508.78	218.06	726.83
75	81.21	21.50	.86044	537.70	179.16	716.87
80	85.41	16.97	0.84831	565.40	141.36	706.76
85	89.41	12.54	.83581	591.89	104.46	696.35
90	93.19	8.23	.82278	616.94	68.55	685.49
95	96.71	4.05	.80895	640.26	33.71	673.97
100	100.00	0.00	.79461	662.02	0.00	662.02

The Manual gives the equivalents of true per cent. for indications of the hydrometer and thermometer. This is deemed to be the best form in which the corrections for temperature can be put for practice, since it saves all arithmetical operations, especially those that would ordinarily be performed mentally, without check and liable to error. For the advantage of those persons, however, who perform such operations with facility, and who would be likely to use from memory a table of the corrections most frequently occurring in practice, a graphic table of corrections is given in plate No. 4, which is so perspicuous as to require no special explanation. The experiments made by Dr. Craig in the laboratory of the Surgeon General's Office follow table IV, preceded by an explanation of the method employed.

The report to the Treasury Department and the tables of the Manual for inspectors of spirits follow next, and complete this portion of the report of the committee to the academy.

TABLE I.—Containing the densities found by Messrs. Gilpin and Blagden for spirits of different strengths, and at various temperatures: extracted from the 84th volume of Philosophical Transactions, 1794.

Temperature 30°.						Temperature 35°.					
Spirit and water by weight.	Quantity of spirit per cent.	Specific gravity.	Spirit and water by weight.	Quantity of spirit per cent.	Specific gravity.	Spirit and water by weight.	Quantity of spirit per cent.	Specific gravity.	Spirit and water by weight.	Quantity of spirit per cent.	Specific gravity.
Sp. + W. 100 + 0	100.00	.83896	W. + Sp. 100 + 100	56.15	.94222	Sp. + W. 100 + 0	100.00	.83672	W. + Sp. 100 + 100	56.18	.94025
5	96.49	.84995	95	54.84	.94447	5	96.49	.84769	95	54.87	.94249
10	93.14	.85957	90	53.45	.94675	10	93.14	.85729	90	53.49	.94484
15	89.99	.86825	85	51.98	.94920	15	89.99	.86587	85	52.02	.94734
20	87.00	.87585	80	50.42	.95173	20	87.00	.87357	80	50.46	.94988
25	84.18	.88282	75	48.75	.95429	25	84.19	.88059	75	48.79	.95246
30	81.53	.88921	70	46.96	.95681	30	81.54	.88701	70	47.00	.95502
35	79.03	.89511	65	45.05	.95944	35	79.05	.89294	65	45.09	.95772
40	76.67	.90054	60	43.00	.96209	40	76.69	.89839	60	43.05	.96048
45	74.44	.90558	55	40.80	.96470	45	74.47	.90345	55	40.85	.96315
50	72.33	.91023	50	38.43	.96719	50	72.35	.90811	50	38.47	.96579
55	70.33	.91449	45	35.87	.96967	55	70.35	.91241	45	35.92	.96840
60	68.42	.91847	40	33.10	.97200	60	68.45	.91640	40	33.15	.97086
65	66.62	.92217	35	30.11	.97418	65	66.65	.92009	35	30.15	.97319
70	64.90	.92563	30	26.80	.97635	70	64.93	.92355	30	26.91	.97556
75	63.27	.92889	25	23.33	.97860	75	63.30	.92680	25	23.38	.97801
80	61.71	.93191	20	19.49	.98108	80	61.74	.92986	20	19.54	.98076
85	60.22	.93474	15	15.30	.98412	85	60.26	.93274	15	15.34	.98397
90	58.81	.93741	10	10.71	.98804	90	58.84	.93541	10	10.73	.98804
95	57.45	.93991	5	5.04	.99334	95	57.48	.93790	5	5.65	.99344

Temperature 40°.						Temperature 45°.					
Spirit and water by weight.	Quantity of spirit per cent.	Specific gravity.	Spirit and water by weight.	Quantity of spirit per cent.	Specific gravity.	Spirit and water by weight.	Quantity of spirit per cent.	Specific gravity.	Spirit and water by weight.	Quantity of spirit per cent.	Specific gravity.
Sp. + W. 100 + 0	100.00	.83445	W. + Sp. 100 + 100	56.22	.93827	Sp. + W. 100 + 0	100.00	.83214	W. + Sp. 100 + 100	56.25	.93621
5	96.49	.84539	95	54.91	.94058	5	96.49	.84310	95	54.95	.93860
10	93.16	.85507	90	53.53	.94295	10	93.16	.85277	90	53.56	.94096
15	90.00	.86361	85	52.06	.94547	15	90.01	.86131	85	52.09	.94348
20	87.02	.87134	80	50.49	.94802	20	87.03	.86905	80	50.53	.94605
25	84.21	.87838	75	48.82	.95060	25	84.23	.87613	75	48.86	.94871
30	81.57	.88481	70	47.04	.95328	30	81.58	.88255	70	47.08	.95143
35	79.07	.89073	65	45.14	.95602	35	79.09	.88849	65	45.17	.95423
40	76.71	.89617	60	43.09	.95879	40	76.73	.89396	60	43.13	.95705
45	74.49	.90127	55	40.89	.96159	45	74.51	.89909	55	40.93	.95993
50	72.38	.90596	50	38.52	.96434	50	72.41	.90380	50	38.57	.96280
55	70.38	.91026	45	35.96	.96706	55	70.41	.90812	45	36.01	.96563
60	68.48	.91428	40	33.20	.96967	60	68.51	.91211	40	33.25	.96840
65	66.67	.91799	35	30.21	.97220	65	66.70	.91584	35	30.26	.97110
70	64.96	.92151	30	26.96	.97472	70	64.99	.91937	30	27.01	.97384
75	63.33	.92476	25	23.42	.97737	75	63.36	.92264	25	23.47	.97666
80	61.77	.92783	20	19.58	.98033	80	61.80	.92570	20	19.62	.97980
85	60.29	.93072	15	15.38	.98373	85	60.32	.92859	15	15.41	.98338
90	58.87	.93341	10	10.76	.98795	90	58.90	.93131	10	10.79	.98774
95	57.52	.93592	5	5.67	.99345	95	57.55	.93382	5	5.69	.99338

TABLE I—Continued.

Temperature 50°.						Temperature 55°.					
Spirit and water by weight.	Quantity of spirit per cent.	Specific gravity.	Spirit and water by weight.	Quantity of spirit per cent.	Specific gravity.	Spirit and water by weight.	Quantity of spirit per cent.	Specific gravity.	Spirit and water by weight.	Quantity of spirit per cent.	Specific gravity.
Sp. + W.			W. + Sp.			Sp. + W.			W. + Sp.		
100 + 0	100.00	.82977	100 + 100	56.29	.93419	100 + 0	100.00	.82736	100 + 100	56.33	.93208
+ 5	96.50	.84706	95	54.99	.93658	5	96.50	.83834	95	55.03	.93452
+ 10	93.17	.85042	90	53.60	.93897	10	93.18	.84802	90	53.64	.93696
+ 15	90.02	.85902	85	52.13	.94149	15	90.03	.85664	85	52.17	.93948
+ 20	87.05	.86676	80	50.57	.94414	20	87.06	.86441	80	50.61	.94213
+ 25	84.25	.87384	75	48.90	.94683	25	84.27	.87150	75	48.94	.94486
+ 30	81.61	.88030	70	47.12	.94958	30	81.63	.87796	70	47.16	.94767
+ 35	79.12	.88626	65	45.22	.95243	35	79.14	.88393	65	45.26	.95057
+ 40	76.76	.89174	60	43.18	.95534	40	76.79	.88945	60	43.22	.95357
+ 45	74.54	.89684	55	40.98	.95831	45	74.57	.89458	55	41.03	.95662
+ 50	72.44	.90160	50	38.61	.96126	50	72.47	.89933	50	38.66	.95966
+ 55	70.44	.90596	45	36.06	.96420	55	70.47	.90367	45	36.11	.96272
+ 60	68.54	.90997	40	33.30	.96708	60	68.57	.90768	40	33.35	.96575
+ 65	66.74	.91370	35	30.31	.96995	65	66.77	.91144	35	30.36	.96877
+ 70	65.02	.91723	30	27.06	.97284	70	65.06	.91502	30	27.11	.97181
+ 75	63.39	.92051	25	23.52	.97589	75	63.43	.91837	25	23.57	.97500
+ 80	61.84	.92358	20	19.67	.97920	80	61.87	.92145	20	19.71	.97847
+ 85	60.85	.92647	15	15.45	.98293	85	60.39	.92436	15	15.49	.98239
+ 90	58.94	.92919	10	10.82	.98745	90	58.97	.92707	10	10.85	.98702
+ 95	57.59	.93177	5	5.70	.99316	95	57.62	.92963	5	5.71	.99284

Temperature 60°.						Temperature 65°.					
Spirit and water by weight.	Quantity of spirit per cent.	Specific gravity.	Spirit and water by weight.	Quantity of spirit per cent.	Specific gravity.	Spirit and water by weight.	Quantity of spirit per cent.	Specific gravity.	Spirit and water by weight.	Quantity of spirit per cent.	Specific gravity.
Sp. + W.			W. + Sp.			Sp. + W.			W. + Sp.		
100 + 0	100.00	.82500	100 + 100	56.36	.93002	100 + 0	100.00	.82262	100 + 100	56.40	.92794
+ 5	96.51	.83599	95	55.06	.93247	5	96.51	.83362	95	55.10	.93040
+ 10	93.19	.84568	90	53.68	.93493	10	93.20	.84334	90	53.72	.93285
+ 15	90.04	.85430	85	52.21	.93749	15	90.05	.85193	85	52.25	.93546
+ 20	87.08	.86208	80	50.65	.94018	20	87.09	.85976	80	50.69	.93822
+ 25	84.28	.86918	75	48.98	.94296	25	84.30	.86686	75	49.02	.94099
+ 30	81.65	.87569	70	47.20	.94579	30	81.67	.87337	70	47.25	.94388
+ 35	79.16	.88169	65	45.30	.94876	35	79.18	.87938	65	45.35	.94689
+ 40	76.81	.88720	60	43.26	.95181	40	76.84	.88490	60	43.31	.95000
+ 45	74.59	.89232	55	41.07	.95493	45	74.62	.89006	55	41.11	.95318
+ 50	72.49	.89707	50	38.71	.95804	50	72.52	.89479	50	38.75	.95635
+ 55	70.49	.90144	45	36.16	.96122	55	70.52	.89920	45	36.20	.95962
+ 60	68.60	.90549	40	33.40	.96437	60	68.63	.90328	40	33.44	.96288
+ 65	66.80	.90927	35	30.40	.96752	65	66.83	.90707	35	30.45	.96620
+ 70	65.09	.91287	30	27.15	.97074	70	65.12	.91066	30	27.20	.96959
+ 75	63.46	.91622	25	23.61	.97410	75	63.49	.91400	25	23.66	.97309
+ 80	61.91	.91933	20	19.75	.97771	80	61.94	.91715	20	19.79	.97688
+ 85	60.43	.92225	15	15.52	.98176	85	60.46	.92010	15	15.56	.98106
+ 90	59.01	.92499	10	10.87	.98654	90	59.04	.92283	10	10.89	.98594
+ 95	57.66	.92758	5	5.73	.99244	95	57.69	.92546	5	5.74	.99194

Temperature 70°.						Temperature 75°.					
Spirit and water by weight.	Quantity of spirit per cent.	Specific gravity.	Spirit and water by weight.	Quantity of spirit per cent.	Specific gravity.	Spirit and water by weight.	Quantity of spirit per cent.	Specific gravity.	Spirit and water by weight.	Quantity of spirit per cent.	Specific gravity.
Sp. + W.			W. + Sp.			Sp. + W.			W. + Sp.		
100 + 0	100.00	.82023	100 + 100	56.44	.92580	100 + 0	100.00	.81780	100 + 100	56.47	.92364
+ 5	96.52	.83124	95	55.14	.92828	5	96.52	.82878	95	55.17	.92613
+ 10	93.20	.84092	90	53.75	.93076	10	93.21	.83851	90	53.79	.92865
+ 15	90.06	.84951	85	52.28	.93337	15	90.07	.84710	85	52.32	.93132
+ 20	87.11	.85736	80	50.73	.93616	20	87.12	.85496	80	50.77	.93413
+ 25	84.32	.86451	75	49.06	.93898	25	84.34	.86212	75	49.10	.93695
+ 30	81.69	.87105	70	47.29	.94193	30	81.71	.86864	70	47.32	.93989
+ 35	79.20	.87705	65	45.39	.94500	35	79.22	.87466	65	45.43	.94301
+ 40	76.86	.88254	60	43.35	.94813	40	76.88	.88018	60	43.39	.94623
+ 45	74.64	.88773	55	41.16	.95139	45	74.67	.88538	55	41.20	.94957
+ 50	72.54	.89252	50	38.80	.95469	50	72.57	.89018	50	38.84	.95292
+ 55	70.55	.89695	45	36.25	.95802	55	70.58	.89464	45	36.29	.95638
+ 60	68.66	.90104	40	33.49	.96143	60	68.68	.89872	40	33.53	.95987
+ 65	66.86	.90484	35	30.50	.96484	65	66.89	.90252	35	30.54	.96344
+ 70	65.15	.90847	30	27.24	.96836	70	65.18	.90617	30	27.29	.96708
+ 75	63.52	.91181	25	23.70	.97203	75	63.55	.90952	25	23.74	.97086
+ 80	61.97	.91493	20	19.83	.97596	80	62.00	.91270	20	19.87	.97495
+ 85	60.49	.91793	15	15.59	.98028	85	60.52	.91569	15	15.62	.97943
+ 90	59.08	.92069	10	10.92	.98527	90	59.11	.91849	10	10.94	.98454
+ 95	57.73	.92333	5	5.75	.99134	95	57.76	.92111	5	5.77	.99066

TABLE I—Continued.

Temperature 80°.											
Spirit and water by weight.	Quantity of spirit per cent.	Specific gravity.	Spirit and water by weight.	Quantity of spirit per cent.	Specific gravity.	Spirit and water by weight.	Quantity of spirit per cent.	Specific gravity.	Spirit and water by weight.	Quantity of spirit per cent.	Specific gravity.
Sp. + W. 100 + 0	100.00	.81530	50	72.60	.88781	W. + Sp. 100 + 100	56.51	.92142	50	38.89	.95111
5	96.52	.82631	55	70.61	.89225	95	55.21	.92393	45	36.34	.95467
10	93.22	.83603	60	68.71	.89639	90	53.83	.92646	40	33.58	.95826
15	90.09	.84467	65	66.92	.90021	85	52.36	.92917	35	30.59	.96192
20	87.13	.85248	70	65.21	.90385	80	50.81	.93201	30	27.33	.96568
25	84.35	.85966	75	63.59	.90723	75	49.14	.93488	25	23.79	.96963
30	81.73	.86622	80	62.04	.91046	70	47.37	.93785	20	19.91	.97385
35	79.25	.87228	85	60.56	.91340	65	45.47	.94102	15	15.65	.97845
40	76.90	.87776	90	59.15	.91622	60	43.43	.94431	10	10.97	.98367
45	74.69	.88301	95	57.80	.91891	55	41.24	.94768	5	5.78	.98991

TABLE II.—Showing Gilpin & Blagden's densities corrected for errors of observation, and reduced to standard of Tralles.

Temperature 30°.							
Spirit and water by weight.	Per cent.	Specific gravity.	Corrected specific gravity.	Spirit and water by weight.	Per cent.	Specific gravity.	Corrected specific gravity.
Sp. W. 100 + 0	92.600	.83821	.83825	W. S. 100 + 100	52.194	.94137	.94136
5	89.365	.84919	.84920	95	50.990	.94362	.94358
10	86.292	.85880	.85880	90	49.708	.94590	.94590
15	83.381	.86747	.86744	85	48.347	.94835	.94833
20	80.635	.87506	.87505	80	46.901	.95087	.95086
25	78.047	.88203	.88202	75	45.360	.95343	.95337
30	75.607	.88841	.88840	70	43.711	.95595	.95592
35	73.306	.89430	.89432	65	41.951	.95858	.95856
40	71.130	.89973	.89975	60	40.063	.96122	.96123
45	69.073	.90476	.90474	55	38.033	.96383	.96400
50	67.126	.90941	.90951	50	35.844	.96632	.96632
55	65.277	.91367	.91368	45	33.483	.96880	.96879
60	63.521	.91764	.91764	40	30.927	.97112	.97114
65	61.854	.92134	.92136	35	28.155	.97330	.97328
70	60.272	.92480	.92476	30	25.144	.97547	.97546
75	58.765	.92805	.92805	25	21.867	.97772	.97790
80	57.326	.93107	.93106	20	18.290	.98020	.98021
85	55.954	.93390	.93387	15	14.373	.98323	.98320
90	54.644	.93657	.93652	10	10.066	.98715	.98712
95	53.392	.93906	.93908	5	5.305	.99245	.99247

Temperature 35°.

100 + 0	92.600	.83597	.83597	100 + 100	52.194	.93940	.93940
+ 5	89.365	.84693	.84692	95	50.990	.94164	.94166
10	86.292	.85652	.85654	90	49.708	.94399	.94400
15	83.381	.86509	.86515	85	48.347	.94649	.94646
20	80.635	.87278	.87281	80	46.901	.94903	.94902
25	78.047	.87980	.87981	75	45.360	.95160	.95157
30	75.607	.88621	.88621	70	43.711	.95416	.95418
35	73.306	.89214	.89214	65	41.951	.95686	.95687
40	71.130	.89758	.89758	60	40.063	.95962	.95960
45	69.073	.90264	.90261	55	38.033	.96228	.96243
50	67.126	.90729	.90736	50	35.844	.96492	.96490
55	65.277	.91159	.91157	45	33.483	.96753	.96749
60	63.521	.91558	.91555	40	30.927	.96999	.96998
65	61.854	.91926	.91928	35	28.155	.97231	.97232
70	60.272	.92272	.92271	30	25.144	.97468	.97469
75	58.765	.92597	.92600	25	21.867	.97713	.97732
80	57.326	.92902	.92903	20	18.290	.97988	.97986
85	55.954	.93190	.93187	15	14.373	.98308	.98305
90	54.644	.93457	.93454	10	10.066	.98715	.98712
95	53.392	.93706	.93709	5	5.305	.99255	.99257

TABLE II—Continued.

Temperature 40°.							
Spirit and water by weight.		Per cent.	Specific gravity.	Corrected specific gravity.	Spirit and water by weight.		Corrected specific gravity.
Sp.	W.				W.	Sp.	
100	+ 0	92. 600	. 83370	. 83367	100	+ 100	52. 194
	+ 5	89. 365	. 84463	. 84462		+ 95	50. 990
	10	86. 292	. 85430	. 85426		90	49. 708
	15	83. 381	. 86283	. 86285		85	48. 347
	20	80. 635	. 87056	. 87055		80	46. 901
	25	78. 047	. 87759	. 87758		75	45. 360
	30	75. 607	. 88401	. 88400		70	43. 711
	35	73. 306	. 88993	. 88994		65	41. 951
	40	71. 130	. 89536	. 89539		60	40. 063
	45	69. 073	. 90046	. 90046		55	38. 043
	50	67. 126	. 90514	. 90519		50	35. 844
	55	65. 277	. 90944	. 90944		45	33. 483
	60	63. 521	. 91346	. 91343		40	30. 927
	65	61. 854	. 91716	. 91717		35	28. 155
	70	60. 272	. 92068	. 92063		30	25. 144
	75	58. 765	. 92393	. 92393		25	21. 867
	80	57. 326	. 92700	. 92698		20	18. 290
	85	55. 954	. 92988	. 92984		15	14. 373
	90	54. 644	. 93257	. 93253		10	10. 066
	95	53. 392	. 93508	. 93508		5	5. 305

Temperature 45°.							
Spirit and water by weight.		Per cent.	Specific gravity.	Corrected specific gravity.	Spirit and water by weight.		Corrected specific gravity.
Sp.	W.				W.	Sp.	
100	+ 0	92. 600	. 83139	. 83135	100	+ 100	52. 194
	+ 5	89. 365	. 84234	. 84230		+ 95	50. 990
	10	86. 292	. 85200	. 85196		90	49. 708
	15	83. 381	. 86053	. 86053		85	48. 347
	20	80. 635	. 86827	. 86827		80	46. 901
	25	78. 047	. 87534	. 87533		75	45. 360
	30	75. 607	. 88176	. 88177		70	43. 711
	35	73. 306	. 88769	. 88772		65	41. 951
	40	71. 130	. 89316	. 89318		60	40. 063
	45	69. 073	. 89828	. 89828		55	38. 033
	50	67. 126	. 90299	. 90299		50	35. 844
	55	65. 277	. 90730	. 90728		45	33. 483
	60	63. 521	. 91129	. 91129		40	30. 927
	65	61. 854	. 91502	. 91504		35	28. 155
	70	60. 272	. 91854	. 91852		30	25. 144
	75	58. 765	. 92181	. 92183		25	21. 867
	80	57. 326	. 92487	. 92490		20	18. 290
	85	55. 954	. 92775	. 92778		15	14. 373
	90	54. 644	. 93047	. 93049		10	10. 066
	95	53. 392	. 93298	. 93304		5	5. 305

Temperature 50°.							
Spirit and water by weight.		Per cent.	Specific gravity.	Corrected specific gravity.	Spirit and water by weight.		Corrected specific gravity.
Sp.	W.				W.	Sp.	
100	+ 0	92. 600	. 82902	. 82901	100	+ 100	52. 194
	5	89. 365	. 84000	. 83997		+ 95	50. 990
	10	86. 292	. 84965	. 84964		90	49. 708
	15	83. 381	. 85825	. 85820		85	48. 347
	20	80. 635	. 86598	. 86597		80	46. 901
	25	78. 047	. 87305	. 87305		75	45. 360
	30	75. 607	. 87951	. 87951		70	43. 711
	35	73. 306	. 88546	. 88547		65	41. 951
	40	71. 130	. 89094	. 89094		60	40. 063
	45	69. 073	. 89603	. 89607		55	38. 033
	50	67. 126	. 90079	. 90077		50	35. 844
	55	65. 277	. 90514	. 90510		45	33. 483
	60	63. 521	. 90915	. 90912		40	30. 927
	65	61. 854	. 91288	. 91288		35	28. 155
	70	60. 272	. 91640	. 91639		30	25. 144
	75	58. 765	. 91968	. 91971		25	21. 867
	80	57. 326	. 92275	. 92280		20	18. 290
	85	55. 954	. 92564	. 92569		15	14. 373
	90	54. 644	. 92835	. 92842		10	10. 066
	95	53. 392	. 93093	. 93098		5	5. 305

TABLE II—Continued.

Temperature 55°.							
Spirit and water by weight.	Per cent.	Specific gravity.	Corrected specific gravity.	Spirit and water by weight.	Per cent.	Specific gravity.	Corrected specific gravity.
Sp. W. 100+ 0	92. 600	.82262	.82666	W. Sp. 100+100	52. 194	.93124	.93129
5	89. 365	.83759	.83762	95	50. 990	.93368	.93369
10	86. 292	.84726	.84730	90	49. 708	.93612	.93613
15	83. 381	.85587	.85586	85	48. 347	.93863	.93868
20	80. 635	.86363	.86365	80	46. 901	.94128	.94136
25	78. 047	.87072	.87075	75	45. 360	.94401	.94407
30	75. 607	.87717	.87723	70	43. 711	.94682	.94688
35	73. 306	.88313	.88320	65	41. 951	.94971	.94978
40	71. 130	.88865	.88868	60	40. 063	.95271	.95276
45	69. 073	.89377	.89383	55	38. 033	.95576	.95577
50	67. 126	.89852	.89853	50	35. 844	.95880	.95879
55	65. 277	.90286	.90289	45	33. 483	.96185	.96184
60	63. 521	.90686	.90693	40	30. 927	.96488	.96487
65	61. 854	.91062	.91069	35	28. 155	.96790	.96789
70	60. 272	.91420	.91423	30	25. 144	.97094	.97095
75	58. 765	.91754	.91756	25	21. 867	.97412	.97420
80	57. 326	.92062	.92067	20	18. 290	.97759	.97763
85	55. 954	.92353	.92358	15	14. 373	.98151	.98152
90	54. 644	.92624	.92632	10	10. 066	.98613	.98614
95	53. 392	.92879	.92889	5	5. 305	.99195	.99197

Temperature 60°.							
100+ 0	92. 600	.82426	.82429	100+100	52. 194	.92918	.92920
5	89. 365	.83524	.83525	95	50. 990	.93163	.93163
10	86. 292	.84492	.84494	90	49. 708	.93409	.93409
15	83. 381	.85353	.85350	85	48. 347	.93665	.93666
20	80. 635	.86130	.86131	80	46. 901	.93933	.93937
25	78. 047	.86840	.86843	75	45. 360	.94211	.94212
30	75. 607	.87490	.87493	70	43. 711	.94494	.94497
35	73. 306	.88090	.88091	65	41. 951	.94791	.94792
40	71. 130	.88640	.88640	60	40. 063	.95095	.95097
45	69. 073	.89152	.89156	55	38. 033	.95407	.95401
50	67. 126	.89626	.89626	50	35. 844	.95718	.95716
55	65. 277	.90063	.90066	45	33. 483	.96035	.96032
60	63. 521	.90468	.90471	40	30. 927	.96350	.96348
65	61. 854	.90845	.90848	35	28. 155	.96665	.96664
70	60. 272	.91205	.91204	30	25. 194	.96987	.96985
75	58. 765	.91539	.91539	25	21. 867	.97322	.97322
80	57. 326	.91850	.91851	20	18. 290	.97683	.97686
85	55. 954	.92142	.92144	15	14. 373	.98088	.98091
90	54. 644	.92416	.92419	10	10. 066	.98565	.98566
95	53. 392	.92675	.92677	5	5. 305	.99155	.99157

Temperature 65°.							
100+ 0	92. 600	.82188	.82190	100+100	52. 194	.92710	.92708
5	89. 365	.83287	.83286	95	50. 990	.92956	.92954
10	86. 292	.84258	.84256	90	49. 708	.93201	.93202
15	83. 381	.85116	.85113	85	48. 347	.93462	.93462
20	80. 635	.85899	.85895	80	46. 901	.93738	.93735
25	78. 047	.86608	.86609	75	45. 360	.94014	.94014
30	75. 607	.87258	.87260	70	43. 711	.94303	.94302
35	73. 306	.87859	.87859	65	41. 951	.94604	.94603
40	71. 130	.88410	.88409	60	40. 063	.94914	.94914
45	69. 073	.88926	.88926	55	38. 033	.95232	.95222
50	67. 136	.89398	.89397	50	35. 844	.95549	.95549
55	65. 277	.89839	.89841	45	33. 483	.95876	.95876
60	63. 521	.90247	.90247	40	30. 927	.96201	.96204
65	61. 854	.90625	.90624	35	28. 155	.96533	.96533
70	60. 272	.90984	.90983	30	25. 144	.96872	.96869
75	58. 765	.91318	.91319	25	21. 867	.97221	.97215
80	57. 326	.91632	.91633	20	18. 290	.97600	.97601
85	55. 954	.91927	.91927	15	14. 373	.98018	.98021
90	54. 644	.92200	.92203	10	10. 066	.98505	.98508
95	53. 392	.92463	.92463	5	5. 305	.99105	.99107

TABLE II—Continued.

Temperature 70°.							
Spirit and water by weight.	Per cent.	Secific gravity.	Corrected specific gravity.	Spirit and water by weight.	Per cent.	Specific gravity.	Corrected specific gravity.
Sp. W. 100+ 0	92.600	.81949	.81949	W. Sp. 100+100	52.194	.92497	.92493
5	89.365	.83049	.83046	95	50.990	.92744	.92742
10	86.292	.84016	.84016	90	49.708	.92992	.92992
15	83.381	.84875	.84875	85	48.347	.93253	.93255
20	80.635	.85659	.85657	80	46.901	.93532	.93530
25	78.047	.86373	.86372	75	45.360	.93813	.93813
30	75.607	.87027	.87025	70	43.711	.94108	.94104
35	73.306	.87626	.87624	65	41.951	.94415	.94411
40	71.130	.88175	.88176	60	40.063	.94728	.94728
45	69.073	.88693	.88693	55	38.033	.95053	.95039
50	67.126	.89172	.89166	50	35.844	.95383	.95378
55	65.277	.89614	.89613	45	33.483	.95716	.95715
60	63.521	.90023	.90020	40	30.927	.96056	.96055
65	61.854	.90403	.90397	35	28.155	.96397	.96397
70	60.272	.90765	.90759	30	25.144	.96749	.96746
75	58.765	.91099	.91097	25	21.867	.97116	.97100
80	57.326	.91411	.91412	20	18.290	.97508	.97508
85	55.954	.91710	.91707	15	14.373	.97940	.97941
90	54.644	.91986	.91984	10	10.066	.98438	.98440
95	53.392	.92250	.92247	5	5.305	.99045	.99047

Temperature 75°.							
100+ 0	92.600	.81706	.81706	100+100	52.194	.92281	.92276
5	89.365	.82803	.82804	95	50.990	.92530	.92528
10	86.292	.83776	.83774	90	49.708	.92781	.92779
15	83.381	.84634	.84635	85	48.347	.93048	.93045
20	80.635	.85419	.85417	80	46.901	.93329	.93322
25	78.047	.86134	.86133	75	45.360	.93611	.93609
30	75.607	.86786	.86787	70	43.711	.93904	.93902
35	73.306	.87387	.87387	65	41.951	.94216	.94216
40	71.130	.87939	.87940	60	40.063	.94538	.94539
45	69.073	.88458	.88458	55	38.033	.94872	.94853
50	67.126	.88938	.88932	50	35.844	.95206	.95203
55	65.277	.89383	.89383	45	33.483	.95552	.95550
60	63.521	.89791	.89791	40	30.927	.95901	.95901
65	61.854	.90171	.90168	35	28.155	.96257	.96255
70	60.272	.90532	.90532	30	25.144	.96621	.96617
75	58.765	.90870	.90872	25	21.867	.96999	.96977
80	57.326	.91188	.91189	20	18.290	.97407	.97406
85	55.954	.91487	.91484	15	14.373	.97855	.97852
90	54.644	.91766	.91762	10	10.066	.98365	.98363
95	53.392	.92028	.92028	5	5.305	.98977	.98977

Temperature 80°.							
100+ 0	92.600	.81457	.81461	100+100	52.194	.92059	.92056
5	89.365	.82557	.82560	95	50.990	.92310	.92311
10	86.292	.83528	.83530	90	49.708	.92563	.92564
15	83.381	.84391	.84394	85	48.347	.92833	.92832
20	80.635	.85171	.85175	80	46.901	.93117	.93111
25	78.047	.85889	.85892	75	45.360	.93404	.93402
30	75.607	.86544	.86547	70	43.711	.93701	.93697
35	73.306	.87150	.87148	65	41.951	.94017	.94017
40	71.130	.87697	.87702	60	40.063	.94346	.94346
45	69.073	.88222	.88220	55	38.033	.94683	.94663
50	67.126	.88701	.88696	50	35.844	.95025	.95024
55	65.277	.89145	.89150	45	33.483	.95381	.95381
60	63.521	.89558	.89559	40	30.927	.95740	.95743
65	61.854	.89940	.89936	35	28.155	.96105	.96107
70	60.272	.90304	.90303	30	25.144	.96481	.96481
75	58.765	.90641	.90644	25	21.867	.96876	.96846
80	57.326	.90964	.90963	20	18.290	.97297	.97296
85	55.954	.91258	.91258	15	14.373	.97757	.97754
90	54.644	.91540	.91537	10	10.066	.98278	.98276
95	53.392	.91808	.91806	5	5.305	.98902	.98897

TABLE III.—*Showing the true densities and volumes of alcohol of every strength, from 1 to 100 per cent., and for every five degrees of temperature from 30° to 100°.*

Temperature 30°.								
Per cent.	Density.	Volume.	Per cent.	Density.	Volume.	Per cent.	Density.	Volume.
0	.99984	1000.7	34	.96825	1009.0	68	.90737	1014.8
1	.99845	1000.8	35	.96720	1009.3	69	.90492	1014.8
2	.99706	1000.8	36	.96615	1009.6	70	.90249	1014.9
3	.99567	1000.8	37	.96509	1010.0	71	.90007	1015.0
4	.99428	1000.9	38	.96403	1010.5	72	.89758	1015.1
5	.99289	1000.9	39	.96268	1010.6	73	.89508	1015.2
6	.99169	1001.0	40	.96132	1010.8	74	.89253	1015.3
7	.99056	1001.1	41	.95991	1011.0	75	.88996	1015.4
8	.98944	1001.2	42	.95848	1011.2	76	.88738	1015.4
9	.98832	1001.4	43	.95699	1011.4	77	.88476	1015.5
10	.98719	1001.5	44	.95547	1011.7	78	.88214	1015.6
11	.98627	1001.7	45	.95393	1011.9	79	.87946	1015.8
12	.98536	1001.9	46	.95233	1012.1	80	.87676	1015.9
13	.98445	1002.1	47	.95069	1012.3	81	.87403	1016.0
14	.98354	1002.3	48	.94894	1012.4	82	.87127	1016.1
15	.98272	1002.5	49	.94716	1012.5	83	.86850	1016.3
16	.98196	1002.8	50	.94537	1012.7	84	.86561	1016.4
17	.98119	1003.1	51	.94356	1012.8	85	.86264	1016.4
18	.98043	1003.4	52	.94172	1013.1	86	.85967	1016.4
19	.97975	1003.7	53	.93983	1013.2	87	.85660	1016.5
20	.97911	1004.1	54	.93784	1013.3	88	.85347	1016.6
21	.97846	1004.5	55	.93580	1013.4	89	.85034	1016.7
22	.97780	1004.9	56	.93378	1013.5	90	.84706	1016.8
23	.97706	1005.2	57	.93173	1013.6	91	.84367	1016.8
24	.97631	1005.4	58	.92965	1013.8	92	.84028	1016.9
25	.97557	1005.7	59	.92754	1013.8	93	.83670	1017.0
26	.97484	1006.1	60	.92535	1013.9	94	.83304	1017.1
27	.97412	1006.4	61	.92320	1014.1	95	.82919	1017.1
28	.97339	1006.8	62	.92104	1014.2	96	.82511	1017.2
29	.97263	1007.2	63	.91880	1014.3	97	.82093	1017.2
30	.97186	1007.6	64	.91656	1014.3	98	.81674	1017.3
31	.97107	1008.0	65	.91431	1014.4	99	.81232	1017.4
32	.97015	1008.3	66	.91205	1014.6	100	.80776	1017.4
33	.96923	1008.6	67	.90979	1014.8			

Temperature 35°.

Per cent.	Density.	Volume.	Per cent.	Density.	Volume.	Per cent.	Density.	Volume.
0	.99999		34	.96692	1007.6	68	.90523	1012.4
1	.99859	1000.9	35	.96583	1007.9	69	.90279	1012.4
2	.99719	1000.9	36	.96473	1008.2	70	.90034	1012.5
3	.99579	1001.0	37	.96360	1008.5	71	.89790	1012.6
4	.99439	1001.0	38	.96247	1008.8	72	.89541	1012.7
5	.99300	1001.0	39	.96108	1008.9	73	.89291	1012.7
6	.99178	1001.1	40	.95969	1009.1	74	.89035	1012.8
7	.99063	1001.2	41	.95824	1009.2	75	.88777	1012.8
8	.98949	1001.3	42	.95679	1009.4	76	.88518	1012.9
9	.98834	1001.4	43	.95527	1009.6	77	.88256	1013.0
10	.98720	1001.5	44	.95372	1009.8	78	.87993	1013.1
11	.98623	1001.6	45	.95214	1010.0	79	.87724	1013.2
12	.98529	1001.8	46	.95051	1010.1	80	.87453	1013.3
13	.98435	1002.0	47	.94884	1010.3	81	.87179	1013.4
14	.98340	1002.1	48	.94707	1010.4	82	.86900	1013.5
15	.98254	1002.4	49	.94528	1010.5	83	.86621	1013.6
16	.98173	1002.6	50	.94347	1010.6	84	.86332	1013.7
17	.98091	1002.8	51	.94164	1010.8	85	.86036	1013.7
18	.98010	1003.0	52	.93976	1010.9	86	.85740	1013.7
19	.97936	1003.3	53	.93785	1011.1	87	.85432	1013.8
20	.97864	1003.6	54	.93585	1011.2	88	.85120	1013.9
21	.97794	1004.0	55	.93382	1011.2	89	.84806	1013.9
22	.97721	1004.2	56	.93178	1011.3	90	.84478	1014.0
23	.97641	1004.5	57	.92970	1011.4	91	.84139	1014.1
24	.97561	1004.7	58	.92761	1011.5	92	.83800	1014.1
25	.97481	1005.0	59	.92549	1011.6	93	.83442	1014.2
26	.97401	1005.2	60	.92330	1011.7	94	.83075	1014.3
27	.97323	1005.5	61	.92113	1011.8	95	.82692	1014.3
28	.97244	1005.8	62	.91895	1011.9	96	.82283	1014.4
29	.97161	1006.1	63	.91672	1012.0	97	.81866	1014.4
30	.97076	1006.4	64	.91447	1012.0	98	.81448	1014.5
31	.96991	1006.8	65	.91220	1012.1	99	.81006	1014.5
32	.96894	1007.1	66	.90992	1012.2	100	.80550	1014.6
33	.96796	1007.3	67	.90765	1012.4			

TABLE III—Continued.

Temperature 40°.								
Per cent.	Density.	Volume.	Per cent.	Density.	Volume.	Per cent.	Density.	Volume.
0	1.00000	1000.9	34	.96555	1006.2	68	.90307	1010.0
1	.99860	1000.9	35	.96441	1006.4	69	.90064	1010.0
2	.99719	1000.9	36	.96325	1006.6	70	.89818	1010.1
3	.99580	1001.0	37	.96206	1006.9	71	.89571	1010.1
4	.99440	1001.0	38	.96086	1007.1	72	.89321	1010.2
5	.99300	1001.0	39	.95945	1007.2	73	.89071	1010.2
6	.99176	1001.1	40	.95803	1007.3	74	.88815	1010.3
7	.99059	1001.1	41	.95656	1007.5	75	.88557	1010.3
8	.98943	1001.2	42	.95507	1007.6	76	.88296	1010.4
9	.98826	1001.3	43	.95352	1007.8	77	.88033	1010.5
10	.98710	1001.4	44	.95194	1007.9	78	.87770	1010.5
11	.98611	1001.5	45	.95032	1008.0	79	.87500	1010.6
12	.98513	1001.6	46	.94866	1008.2	80	.87228	1010.7
13	.98415	1001.8	47	.94697	1008.3	81	.86953	1010.8
14	.98317	1001.9	48	.94518	1008.4	82	.86672	1010.8
15	.98227	1002.0	49	.94336	1008.5	83	.86392	1010.9
16	.98141	1002.2	50	.94153	1008.6	84	.86102	1011.0
17	.98054	1002.4	51	.93969	1008.7	85	.85807	1011.0
18	.97968	1002.6	52	.93778	1008.8	86	.85512	1011.0
19	.97888	1002.8	53	.93584	1008.9	87	.85203	1011.1
20	.97811	1003.1	54	.93384	1009.0	88	.84891	1011.1
21	.97733	1003.3	55	.93180	1009.1	89	.84577	1011.2
22	.97655	1003.6	56	.92975	1009.1	90	.84248	1011.3
23	.97569	1003.7	57	.92766	1009.2	91	.83909	1011.3
24	.97483	1003.9	58	.92555	1009.3	92	.83570	1011.3
25	.97397	1004.1	59	.92342	1009.3	93	.83212	1011.4
26	.97312	1004.3	60	.92123	1009.4	94	.82848	1011.5
27	.97228	1004.6	61	.91904	1009.5	95	.82461	1011.5
28	.97143	1004.8	62	.91684	1009.6	96	.82054	1011.6
29	.97053	1005.0	63	.91460	1009.6	97	.81638	1011.6
30	.96962	1005.3	64	.91234	1009.7	98	.81220	1011.7
31	.96869	1005.5	65	.91007	1009.7	99	.80778	1011.7
32	.96767	1005.7	66	.90778	1009.8	100	.80323	1011.8
33	.96664	1006.0	67	.90548	1009.9			

Temperature 45°.								
0	.99993		34	.96413	1004.7	68	.90087	1007.5
1	.99852	1000.8	35	.96294	1004.9	69	.89846	1007.5
2	.99712	1000.9	36	.96173	1005.0	70	.89598	1007.6
3	.99571	1000.9	37	.96047	1005.2	71	.89350	1007.6
4	.99430	1000.9	38	.95921	1005.4	72	.89099	1007.7
5	.99290	1000.9	39	.95778	1005.5	73	.88849	1007.7
6	.99165	1000.9	40	.95634	1005.6	74	.88593	1007.8
7	.99046	1001.0	41	.95483	1005.7	75	.88334	1007.8
8	.98927	1001.1	42	.95331	1005.8	76	.88074	1007.8
9	.98808	1001.1	43	.95173	1005.9	77	.87809	1007.9
10	.98690	1001.2	44	.95012	1006.0	78	.87545	1007.9
11	.98587	1001.3	45	.94847	1006.1	79	.87273	1008.0
12	.98487	1001.4	46	.94679	1006.2	80	.87000	1008.0
13	.98386	1001.5	47	.94507	1006.3	81	.86724	1008.1
14	.98285	1001.6	48	.94326	1006.3	82	.86442	1008.1
15	.98190	1001.7	49	.94143	1006.4	83	.86160	1008.2
16	.98099	1001.8	50	.93958	1006.5	84	.85871	1008.3
17	.98008	1001.9	51	.93771	1006.5	85	.85576	1008.3
18	.97917	1002.1	52	.93578	1006.7	86	.85282	1008.3
19	.97832	1002.2	53	.93381	1006.7	87	.84973	1008.3
20	.97748	1002.4	54	.93180	1006.8	88	.84660	1008.4
21	.97664	1002.6	55	.92975	1006.8	89	.84345	1008.4
22	.97580	1002.8	56	.92769	1006.9	90	.84016	1008.5
23	.97490	1002.9	57	.92558	1006.9	91	.83677	1008.5
24	.97399	1003.1	58	.92346	1007.0	92	.83338	1008.6
25	.97308	1003.2	59	.92131	1007.0	93	.82980	1008.6
26	.97217	1003.3	60	.91912	1007.1	94	.82615	1008.6
27	.97127	1003.5	61	.91692	1007.2	95	.82230	1008.7
28	.97036	1003.7	62	.91471	1007.2	96	.81823	1008.7
29	.96940	1003.8	63	.91246	1007.3	97	.81407	1008.8
30	.96842	1004.0	64	.91020	1007.3	98	.80990	1008.8
31	.96744	1004.2	65	.90791	1007.3	99	.80548	1008.8
32	.96636	1004.4	66	.90560	1007.4	100	.80094	1008.9
33	.96527	1004.5	67	.90328	1007.5			

TABLE III—Continued.

Temperature 50°.

Per cent.	Density.	Volume.	Per cent.	Density.	Volume.	Per cent.	Density.	Volume.
0	.99975	1000.6	34	.96268	1003.2	68	.89866	1005.0
1	.99834	1000.7	35	.96143	1003.3	69	.89625	1005.1
2	.99693	1000.7	36	.96018	1003.4	70	.89376	1005.1
3	.99552	1000.7	37	.95885	1003.5	71	.89126	1005.1
4	.99411	1000.7	38	.95753	1003.6	72	.88875	1005.1
5	.99270	1000.7	39	.95608	1003.7	73	.88624	1005.2
6	.99143	1000.7	40	.95461	1003.7	74	.88367	1005.2
7	.99023	1000.8	41	.95307	1003.8	75	.88108	1005.2
8	.98902	1000.8	42	.95152	1003.9	76	.87847	1005.3
9	.98782	1000.8	43	.94991	1004.0	77	.87582	1005.3
10	.98661	1000.9	44	.94828	1004.0	78	.87317	1005.3
11	.98556	1000.9	45	.94660	1004.1	79	.87045	1005.4
12	.98451	1001.0	46	.94488	1004.1	80	.86771	1005.4
13	.98347	1001.1	47	.94314	1004.2	81	.86493	1005.4
14	.98243	1001.1	48	.94131	1004.3	82	.86211	1005.5
15	.98144	1001.2	49	.93946	1004.3	83	.85928	1005.5
16	.98049	1001.3	50	.93759	1004.3	84	.85639	1005.5
17	.97954	1001.4	51	.93570	1004.4	85	.85344	1005.5
18	.97859	1001.5	52	.93374	1004.5	86	.85050	1005.6
19	.97767	1001.6	53	.93176	1004.5	87	.84742	1005.6
20	.97677	1001.7	54	.92974	1004.6	88	.84427	1005.6
21	.97588	1001.8	55	.92768	1004.6	89	.84112	1005.6
22	.97497	1002.0	56	.92559	1004.6	90	.83782	1005.7
23	.97402	1002.0	57	.92349	1004.6	91	.83443	1005.7
24	.97307	1002.1	58	.92135	1004.7	92	.83104	1005.7
25	.97212	1002.2	59	.91920	1004.7	93	.82746	1005.7
26	.97115	1002.3	60	.91699	1004.8	94	.82380	1005.8
27	.97019	1002.4	61	.91478	1004.8	95	.81997	1005.8
28	.96923	1002.5	62	.91255	1004.8	96	.81589	1005.8
29	.96821	1002.6	63	.91029	1004.9	97	.81174	1005.9
30	.96718	1002.7	64	.90802	1004.9	98	.80756	1005.9
31	.96614	1002.9	65	.90573	1004.9	99	.80316	1005.9
32	.96500	1003.0	66	.90341	1005.0	100	.79862	1006.0
33	.96387	1003.1	67	.90107	1005.0			

Temperature 55°.

0	.99947		34	.96117	1001.6	68	.89642	1002.5
1	.99805	1000.4	35	.95988	1001.7	69	.89401	1002.5
2	.99664	1000.4	36	.95858	1001.7	70	.89151	1002.6
3	.99523	1000.4	37	.95720	1001.8	71	.88901	1002.6
4	.99381	1000.4	38	.95582	1001.9	72	.88649	1002.6
5	.99240	1000.4	39	.95434	1001.9	73	.88397	1002.6
6	.99112	1000.4	40	.95285	1001.9	74	.88140	1002.6
7	.98990	1000.4	41	.95128	1001.9	75	.87880	1002.6
8	.98867	1000.5	42	.94970	1002.0	76	.87618	1002.6
9	.98745	1000.5	43	.94805	1002.0	77	.87353	1002.7
10	.98622	1000.5	44	.94639	1002.0	78	.87087	1002.7
11	.98513	1000.5	45	.94468	1002.1	79	.86814	1002.7
12	.98407	1000.5	46	.94294	1002.1	80	.86539	1002.7
13	.98299	1000.6	47	.94117	1002.1	81	.86261	1002.7
14	.98192	1000.6	48	.93932	1002.1	82	.85978	1002.7
15	.98090	1000.6	49	.93746	1002.2	83	.85694	1002.8
16	.97991	1000.7	50	.93557	1002.2	84	.85405	1002.8
17	.97891	1000.7	51	.93367	1002.2	85	.85110	1002.8
18	.97792	1000.8	52	.93168	1002.2	86	.84816	1002.8
19	.97695	1000.8	53	.92968	1002.3	87	.84507	1002.8
20	.97599	1000.9	54	.92764	1002.3	88	.84192	1002.8
21	.97503	1001.0	55	.92558	1002.3	89	.83877	1002.8
22	.97407	1001.0	56	.92348	1002.3	90	.83547	1002.8
23	.97308	1001.1	57	.92136	1002.3	91	.83208	1002.9
24	.97209	1001.1	58	.91921	1002.4	92	.82869	1002.9
25	.97109	1001.1	59	.91704	1002.4	93	.82511	1002.9
26	.97008	1001.2	60	.91483	1002.4	94	.82146	1002.9
27	.96906	1001.2	61	.91260	1002.4	95	.81763	1002.9
28	.96805	1001.3	62	.91036	1002.4	96	.81356	1002.9
29	.96697	1001.3	63	.90810	1002.4	97	.80941	1002.9
30	.96588	1001.4	64	.90583	1002.5	98	.80523	1003.0
31	.96478	1001.4	65	.90353	1002.5	99	.80082	1003.0
32	.96360	1001.5	66	.90118	1002.5	100	.79630	1003.0
33	.96241	1001.5	67	.89883	1002.5			

TABLE III—Continued.

Temperature 60°.								
Per cent.	Density.	Volume.	Per cent.	Density.	Volume.	Per cent.	Density.	Volume.
0	.99910	1000.0	34	.95963	1000.0	68	.89415	1000.0
1	.99768	1000.0	35	.95829	1000.0	69	.89174	1000.0
2	.99626	1000.0	36	.95693	1000.0	70	.88923	1000.0
3	.99484	1000.0	37	.95549	1000.0	71	.88673	1000.0
4	.99342	1000.0	38	.95406	1000.0	72	.88420	1000.0
5	.99200	1000.0	39	.95256	1000.0	73	.88168	1000.0
6	.99071	1000.0	40	.95106	1000.0	74	.87911	1000.0
7	.98947	1000.0	41	.94946	1000.0	75	.87651	1000.0
8	.98822	1000.0	42	.94784	1000.0	76	.87388	1000.0
9	.98698	1000.0	43	.94616	1000.0	77	.87122	1000.0
10	.98574	1000.0	44	.94447	1000.0	78	.86855	1000.0
11	.98463	1000.0	45	.94274	1000.0	79	.86581	1000.0
12	.98353	1000.0	46	.94098	1000.0	80	.86306	1000.0
13	.98242	1000.0	47	.93918	1000.0	81	.86027	1000.0
14	.98132	1000.0	48	.93731	1000.0	82	.85743	1000.0
15	.98026	1000.0	49	.93543	1000.0	83	.85458	1000.0
16	.97923	1000.0	50	.93353	1000.0	84	.85168	1000.0
17	.97819	1000.0	51	.93161	1000.0	85	.84874	1000.0
18	.97716	1000.0	52	.92959	1000.0	86	.84580	1000.0
19	.97614	1000.0	53	.92756	1000.0	87	.84271	1000.0
20	.97512	1000.0	54	.92552	1000.0	88	.83955	1000.0
21	.97410	1000.0	55	.92344	1000.0	89	.83640	1000.0
22	.97308	1000.0	56	.92134	1000.0	90	.83310	1000.0
23	.97205	1000.0	57	.91921	1000.0	91	.82971	1000.0
24	.97103	1000.0	58	.91705	1000.0	92	.82632	1000.0
25	.97000	1000.0	59	.91487	1000.0	93	.82274	1000.0
26	.96894	1000.0	60	.91264	1000.0	94	.81907	1000.0
27	.96787	1000.0	61	.91040	1000.0	95	.81525	1000.0
28	.96680	1000.0	62	.90815	1000.0	96	.81117	1000.0
29	.96568	1000.0	63	.90589	1000.0	97	.80703	1000.0
30	.96454	1000.0	64	.90360	1000.0	98	.80284	1000.0
31	.96339	1000.0	65	.90130	1000.0	99	.79846	1000.0
32	.96215	1000.0	66	.89894	1000.0	100	.79390	1000.0
33	.96092	1000.0	67	.89656	1000.0			

Temperature 65°.

0	.99863		34	.95804	998.3	68	.89185	997.4
1	.99721	999.5	35	.95666	998.3	69	.88944	997.4
2	.99578	999.5	36	.95525	998.2	70	.88693	997.4
3	.99435	999.5	37	.95376	998.2	71	.88442	997.4
4	.99293	999.5	38	.95227	998.1	72	.88189	997.4
5	.99150	999.5	39	.95075	998.1	73	.87936	997.4
6	.99020	999.5	40	.94923	998.1	74	.87679	997.4
7	.98893	999.5	41	.94760	998.0	75	.87418	997.3
8	.98768	999.4	42	.94594	998.0	76	.87155	997.3
9	.98642	999.4	43	.94424	998.0	77	.86888	997.3
10	.98516	999.4	44	.94252	997.9	78	.86622	997.3
11	.98402	999.4	45	.94077	997.9	79	.86346	997.3
12	.98290	999.4	46	.93898	997.9	80	.86070	997.3
13	.98176	999.3	47	.93716	997.9	81	.85791	997.3
14	.98063	999.3	48	.93527	997.8	82	.85507	997.3
15	.97953	999.2	49	.93337	997.8	83	.85221	997.2
16	.97846	999.2	50	.93145	997.8	84	.84931	997.2
17	.97739	999.2	51	.92952	997.8	85	.84636	997.2
18	.97632	999.1	52	.92748	997.7	86	.84342	997.2
19	.97524	999.1	53	.92543	997.7	87	.84032	997.2
20	.97416	999.0	54	.92337	997.7	88	.83717	997.2
21	.97309	999.0	55	.92128	997.7	89	.83401	997.1
22	.97201	998.9	56	.91917	997.6	90	.83071	997.1
23	.97095	998.9	57	.91703	997.6	91	.82732	997.1
24	.96990	998.8	58	.91486	997.6	92	.82393	997.1
25	.96884	998.8	59	.91267	997.6	93	.82035	997.1
26	.96773	998.8	60	.91044	997.6	94	.81670	997.1
27	.96662	998.7	61	.90818	997.6	95	.81287	997.1
28	.96550	998.7	62	.90591	997.5	96	.80879	997.1
29	.96433	998.6	63	.90365	997.5	97	.80465	997.1
30	.96314	998.6	64	.90136	997.5	98	.80048	997.1
31	.96194	998.5	65	.89905	997.5	99	.79608	997.1
32	.96066	998.5	66	.89667	997.5	100	.79156	997.1
33	.95938	998.4	67	.89427	997.5			

TABLE III—Continued.

Temperature 70°.								
Per cent.	Density.	Volume.	Per cent.	Density.	Volume.	Per cent.	Density.	Volume.
0	.99807	999.0	34	.95641	996.7	68	.88954	994.8
1	.99664	999.0	35	.95499	996.6	69	.88711	994.8
2	.99520	998.9	36	.95354	996.5	70	.88460	994.8
3	.99377	998.9	37	.95199	996.3	71	.88209	994.8
4	.99234	998.9	38	.95044	996.2	72	.87955	994.7
5	.99091	998.9	39	.94891	996.2	73	.87702	994.7
6	.98959	998.9	40	.94737	996.1	74	.87444	994.7
7	.98831	998.8	41	.94571	996.1	75	.87183	994.7
8	.98704	998.8	42	.94403	996.0	76	.86920	994.6
9	.98576	998.8	43	.94228	995.9	77	.86652	994.6
10	.98448	998.7	44	.94053	995.8	78	.86385	994.6
11	.98332	998.7	45	.93877	995.8	79	.86109	994.6
12	.98216	998.6	46	.93696	995.7	80	.85832	994.5
13	.98100	998.6	47	.93511	995.7	81	.85553	994.5
14	.97984	998.5	48	.93321	995.6	82	.85269	994.5
15	.97872	998.4	49	.93129	995.6	83	.84983	994.4
16	.97761	998.4	50	.92935	995.5	84	.84692	994.4
17	.97651	998.3	51	.92740	995.5	85	.84397	994.4
18	.97540	998.2	52	.92533	995.4	86	.84102	994.4
19	.97427	998.1	53	.92328	995.4	87	.83792	994.3
20	.97313	998.0	54	.92119	995.3	88	.83477	994.3
21	.97199	997.8	55	.91909	995.3	89	.83161	994.3
22	.97086	997.7	56	.91697	995.3	90	.82830	994.2
23	.96978	997.7	57	.91482	995.2	91	.82491	994.2
24	.96870	997.6	58	.91264	995.2	92	.82152	994.2
25	.96762	997.6	59	.91044	995.2	93	.81794	994.2
26	.96647	997.5	60	.90820	995.1	94	.81428	994.2
27	.96531	997.4	61	.90592	995.1	95	.81046	994.1
28	.96415	997.3	62	.90364	995.0	96	.80640	994.1
29	.96293	997.2	63	.90138	995.0	97	.80224	994.1
30	.96169	997.1	64	.89909	995.0	98	.79808	994.1
31	.96045	997.0	65	.89677	995.0	99	.79368	994.0
32	.95912	996.9	66	.89438	994.9	100	.78917	994.0
33	.95779	996.7	67	.89196	994.9			

Temperature 75°.

Per cent.	Density.	Volume.	Per cent.	Density.	Volume.	Per cent.	Density.	Volume.
0	.99741		34	.95474	994.9	68	.88719	992.2
1	.99596	998.3	35	.95327	994.7	69	.88476	992.2
2	.99453	998.3	36	.95178	994.6	70	.88224	992.1
3	.99309	998.2	37	.95018	994.4	71	.87973	992.1
4	.99165	998.2	38	.94858	994.3	72	.87719	992.1
5	.99021	998.2	39	.94703	994.2	73	.87465	992.0
6	.98888	998.2	40	.94548	994.1	74	.87206	992.0
7	.98758	998.1	41	.94379	994.0	75	.86945	992.0
8	.98630	998.1	42	.94207	993.9	76	.86681	991.9
9	.98500	998.0	43	.94029	993.8	77	.86414	991.9
10	.98372	998.0	44	.93851	993.7	78	.86146	991.8
11	.98252	997.9	45	.93673	993.6	79	.85869	991.8
12	.98134	997.8	46	.93490	993.5	80	.85593	991.7
13	.98015	997.7	47	.93303	993.5	81	.85313	991.7
14	.97896	997.6	48	.93112	993.4	82	.85029	991.7
15	.97781	997.5	49	.92917	993.3	83	.84743	991.6
16	.97667	997.4	50	.92722	993.2	84	.84452	991.6
17	.97553	997.3	51	.92526	993.1	85	.84156	991.5
18	.97439	997.2	52	.92317	993.1	86	.83860	991.5
19	.97321	997.0	53	.92109	993.0	87	.83550	991.4
20	.97201	996.8	54	.91899	992.9	88	.83235	991.4
21	.97081	996.6	55	.91686	992.9	89	.82919	991.4
22	.96962	996.5	56	.91474	992.8	90	.82589	991.4
23	.96853	996.4	57	.91259	992.8	91	.82249	991.3
24	.96743	996.3	58	.91041	992.8	92	.81910	991.3
25	.96633	996.2	59	.90819	992.7	93	.81551	991.2
26	.96514	996.1	60	.90593	992.7	94	.81185	991.2
27	.96394	995.9	61	.90364	992.6	95	.80802	991.2
28	.96274	995.8	62	.90135	992.5	96	.80397	991.2
29	.96147	995.6	63	.89909	992.5	97	.79982	991.1
30	.96019	995.5	64	.89679	992.5	98	.79565	991.0
31	.95891	995.4	65	.89447	992.4	99	.79126	991.0
32	.95754	995.2	66	.89207	992.4	100	.78675	991.0
33	.95616	995.1	67	.88963	992.3			

TABLE III—Continued.

Temperature 80°.								
Per cent.	Density.	Volume.	Per cent.	Density.	Volume.	Per cent.	Density.	Volume.
0	.99666	997.5	34	.95303	993.1	68	.88482	989.6
1	.99521	997.5	35	.95152	992.9	69	.88238	989.5
2	.99376	997.5	36	.94998	992.7	70	.87986	989.5
3	.99231	997.5	37	.94833	992.5	71	.87735	989.4
4	.99086	997.4	38	.94668	992.3	72	.87481	989.4
5	.98941	997.4	39	.94512	992.2	73	.87226	989.3
6	.98806	997.3	40	.94355	992.1	74	.86967	989.3
7	.98676	997.3	41	.94183	992.0	75	.86705	989.2
8	.98546	997.2	42	.94008	991.8	76	.86442	989.2
9	.98415	997.1	43	.93826	991.7	77	.86173	989.1
10	.98285	997.1	44	.93645	991.5	78	.85905	989.1
11	.98163	997.0	45	.93466	991.4	79	.85628	989.0
12	.98042	996.8	46	.93281	991.3	80	.85351	988.9
13	.97920	996.7	47	.93092	991.2	81	.85072	988.9
14	.97799	996.6	48	.92899	991.1	82	.84787	988.9
15	.97681	996.5	49	.92703	991.0	83	.84502	988.8
16	.97564	996.3	50	.92506	990.9	84	.84211	988.8
17	.97447	996.2	51	.92309	990.9	85	.83914	988.7
18	.97330	996.1	52	.92097	990.7	86	.83617	988.6
19	.97207	995.8	53	.91888	990.6	87	.83306	988.6
20	.97081	995.6	54	.91675	990.5	88	.82991	988.5
21	.96955	995.3	55	.91461	990.5	89	.82675	988.5
22	.96831	995.1	56	.91248	990.4	90	.82344	988.4
23	.96720	995.0	57	.91033	990.3	91	.82004	988.3
24	.96608	994.9	58	.90813	990.3	92	.81665	988.3
25	.96497	994.8	59	.90591	990.2	93	.81306	988.2
26	.96375	994.6	60	.90365	990.2	94	.80941	988.2
27	.96251	994.5	61	.90134	990.1	95	.80558	988.2
28	.96126	994.3	62	.89903	990.0	96	.80152	988.1
29	.95996	994.1	63	.89677	989.9	97	.79738	988.0
30	.95865	993.9	64	.89447	989.9	98	.79320	988.0
31	.95733	993.7	65	.89215	989.9	99	.78882	987.9
32	.95591	993.5	66	.88973	989.8	100	.78432	987.9
33	.95449	993.3	67	.88727	989.6			

Temperature 85°.

Per cent.	Density.	Volume.	Per cent.	Density.	Volume.	Per cent.	Density.	Volume.
0	.99581		34	.95126	991.3	68	.88243	986.9
1	.99435	996.7	35	.94971	991.1	69	.87997	986.8
2	.99289	996.6	36	.94813	990.8	70	.87746	986.8
3	.99143	996.6	37	.94644	990.5	71	.87495	986.7
4	.98997	996.5	38	.94475	990.2	72	.87240	986.7
5	.98851	996.5	39	.94317	990.1	73	.86985	986.6
6	.98716	996.4	40	.94159	990.0	74	.86726	986.5
7	.98584	996.3	41	.93984	989.9	75	.86464	986.5
8	.98452	996.3	42	.93806	989.7	76	.86200	986.4
9	.98320	996.2	43	.93620	989.5	77	.85930	986.3
10	.98189	996.1	44	.93436	989.3	78	.85662	986.3
11	.98065	996.0	45	.93257	989.2	79	.85385	986.2
12	.97941	995.8	46	.93070	989.1	80	.85107	986.1
13	.97817	995.7	47	.92878	988.9	81	.84828	986.1
14	.97693	995.5	48	.92683	988.8	82	.84544	986.0
15	.97572	995.4	49	.92487	988.7	83	.84260	986.0
16	.97452	995.2	50	.92288	988.6	84	.83968	985.9
17	.97333	995.0	51	.92089	988.5	85	.83669	985.8
18	.97213	994.9	52	.91875	988.3	86	.83371	985.7
19	.97085	994.6	53	.91664	988.2	87	.83060	985.6
20	.96953	994.3	54	.91449	988.1	88	.82745	985.6
21	.96821	994.0	55	.91233	988.0	89	.82429	985.5
22	.96692	993.7	56	.91019	987.9	90	.82097	985.4
23	.96580	993.6	57	.90805	987.9	91	.81759	985.4
24	.96468	993.5	58	.90585	987.8	92	.81418	985.3
25	.96355	993.4	59	.90361	987.7	93	.81059	985.2
26	.96229	993.1	60	.90133	987.6	94	.80692	985.2
27	.96101	992.9	61	.89901	987.5	95	.80310	985.1
28	.95973	992.7	62	.89668	987.4	96	.79904	985.1
29	.95839	992.5	63	.89442	987.3	97	.79489	985.0
30	.95705	992.2	64	.89213	987.3	98	.79074	984.9
31	.95569	992.0	65	.88980	987.2	99	.78636	984.8
32	.95423	991.8	66	.88737	987.1	100	.78185	984.8
33	.95277	991.5	67	.88489	987.0			

TABLE III—Continued.

Temperature 90°.								
Per cent.	Density.	Volume.	Per cent.	Density.	Volume.	Per cent.	Density.	Volume.
0	.99487	995.7	34	.94946	989.4	68	.88000	984.2
1	.99339	995.7	35	.94787	989.1	69	.87753	984.1
2	.99193	995.7	36	.94625	988.8	70	.87502	984.0
3	.99046	995.6	37	.94451	988.5	71	.87252	984.0
4	.98899	995.5	38	.94278	988.2	72	.86996	983.9
5	.98752	995.5	39	.94119	988.1	73	.86741	983.8
6	.98615	995.4	40	.93960	988.0	74	.86481	983.7
7	.98481	995.3	41	.93782	987.7	75	.86219	983.7
8	.98349	995.2	42	.93600	987.5	76	.85954	983.6
9	.98216	995.1	43	.93411	987.3	77	.85685	983.5
10	.98083	995.0	44	.93224	987.1	78	.85416	983.4
11	.97957	994.9	45	.93044	987.0	79	.85139	983.3
12	.97830	994.7	46	.92855	986.8	80	.84861	983.3
13	.97704	994.5	47	.92661	986.6	81	.84581	983.2
14	.97578	994.4	48	.92465	986.5	82	.84299	983.2
15	.97454	994.2	49	.92267	986.4	83	.84016	983.1
16	.97332	994.0	50	.92067	986.2	84	.83723	983.0
17	.97209	993.8	51	.91866	986.1	85	.83423	982.9
18	.97086	993.6	52	.91650	985.9	86	.83123	982.8
19	.96954	993.2	53	.91438	985.8	87	.82812	982.7
20	.96816	992.9	54	.91221	985.6	88	.82497	982.6
21	.96679	992.5	55	.91002	985.5	89	.82181	982.6
22	.96545	992.2	56	.90787	985.4	90	.81850	982.5
23	.96432	992.1	57	.90574	985.3	91	.81510	982.4
24	.96319	991.9	58	.90353	985.3	92	.81169	982.3
25	.96206	991.8	59	.90127	985.1	93	.80810	982.2
26	.96077	991.6	60	.89899	985.0	94	.80444	982.1
27	.95946	991.3	61	.89665	984.9	95	.80062	982.0
28	.95814	991.0	62	.89431	984.8	96	.79655	981.9
29	.95677	990.8	63	.89205	984.7	97	.79241	981.8
30	.95540	990.5	64	.88976	984.7	98	.78826	981.7
31	.95401	990.3	65	.88743	984.6	99	.78388	981.7
32	.95251	990.0	66	.88498	984.5	100	.77937	981.6
33	.95101	989.7	67	.88248	984.3			

Temperature 95°.

0	.99383		34	.94762	987.5	68	.87756	981.5
1	.99235	994.7	35	.94598	987.2	69	.87506	981.3
2	.99087	994.6	36	.94432	986.8	70	.87256	981.3
3	.98938	994.5	37	.94255	986.5	71	.87007	981.2
4	.98790	994.4	38	.94077	986.1	72	.86751	981.1
5	.98642	994.4	39	.93917	985.9	73	.86495	981.0
6	.98504	994.3	40	.93758	985.8	74	.86235	980.9
7	.98369	994.2	41	.93576	985.6	75	.85972	980.8
8	.98235	994.1	42	.93391	985.3	76	.85707	980.8
9	.98101	994.0	43	.93198	985.0	77	.85437	980.7
10	.97967	993.8	44	.93008	984.8	78	.85168	980.6
11	.97839	992.7	45	.92828	984.7	79	.84891	980.5
12	.97710	993.5	46	.92637	984.5	80	.84613	980.4
13	.97581	993.3	47	.92440	984.3	81	.84334	980.3
14	.97453	993.1	48	.92243	984.1	82	.84052	980.3
15	.97327	992.9	49	.92044	984.0	83	.83770	980.3
16	.97202	992.6	50	.91843	983.8	84	.83476	980.1
17	.97077	992.4	51	.91641	983.7	85	.83175	980.0
18	.96952	992.2	52	.91422	983.5	86	.82874	979.8
19	.96814	991.8	53	.91209	983.3	87	.82562	979.7
20	.96672	991.4	54	.90989	983.1	88	.82247	979.7
21	.96529	991.0	55	.90768	982.9	89	.81931	979.6
22	.96390	990.6	56	.90552	982.8	90	.81599	979.5
23	.96277	990.5	57	.90340	982.8	91	.81259	979.4
24	.96164	990.3	58	.90119	982.7	92	.80918	979.3
25	.96051	990.2	59	.89892	982.6	93	.80559	979.2
26	.95919	989.9	60	.89663	982.5	94	.80193	979.1
27	.95785	989.7	61	.89427	982.3	95	.79810	979.0
28	.95650	989.3	62	.89191	982.1	96	.79405	979.0
29	.95510	989.0	63	.88966	982.1	97	.78991	978.8
30	.95370	988.8	64	.88737	982.0	98	.78576	978.7
31	.95229	988.5	65	.88503	982.0	99	.78138	978.6
32	.95075	988.2	66	.88256	981.8	100	.77688	978.6
33	.94921	987.8	67	.88006	981.6			

TABLE III—Continued.

Temperature 100°.								
Per cent.	Density.	Volume.	Per cent.	Density.	Volume.	Per cent.	Density.	Volume.
0	.99270	993.6	34	.94573	985.5	68	.87508	978.7
1	.99121	993.5	35	.94406	985.2	69	.87256	978.5
2	.98971	993.4	36	.94236	984.8	70	.87008	978.5
3	.98821	993.3	37	.94054	984.4	71	.86759	978.4
4	.98672	993.3	38	.93872	983.9	72	.86504	978.3
5	.98523	993.2	39	.93712	983.8	73	.86248	978.2
6	.98383	993.1	40	.93552	983.7	74	.85987	978.1
7	.98248	992.9	41	.93367	983.4	75	.85724	978.0
8	.98112	992.9	42	.93179	983.1	76	.85458	977.9
9	.97977	992.7	43	.92982	982.7	77	.85187	977.8
10	.97842	992.6	44	.92789	982.5	78	.84918	977.7
11	.97711	992.4	45	.92609	982.3	79	.84641	977.6
12	.97580	992.1	46	.92416	982.1	80	.84363	977.5
13	.97449	991.9	47	.92218	981.9	81	.84085	977.4
14	.97319	991.7	48	.92020	981.8	82	.83804	977.4
15	.97191	991.5	49	.91819	981.6	83	.83524	977.4
16	.97063	991.2	50	.91616	981.4	84	.83229	977.2
17	.96937	991.0	51	.91413	981.2	85	.82926	977.1
18	.96810	990.7	52	.91192	981.0	86	.82623	976.9
19	.96668	990.3	53	.90977	980.8	87	.82310	976.7
20	.96519	989.8	54	.90755	980.6	88	.81995	976.7
21	.96371	989.3	55	.90531	980.4	89	.81679	976.6
22	.96227	988.9	56	.90316	980.3	90	.81348	976.5
23	.96115	988.8	57	.90104	980.2	91	.81007	976.3
24	.96002	988.7	58	.89882	980.1	92	.80666	976.2
25	.95889	988.6	59	.89654	980.0	93	.80306	976.1
26	.95755	988.2	60	.89423	979.8	94	.79939	976.0
27	.95617	987.9	61	.89186	979.6	95	.79556	975.8
28	.95479	987.6	62	.88948	979.4	96	.79150	975.7
29	.95338	987.3	63	.88724	979.4	97	.78737	975.6
30	.95195	987.0	64	.88495	979.4	98	.78322	975.5
31	.95051	986.6	65	.88261	979.3	99	.77886	975.4
32	.94894	986.3	66	.88013	979.1	100	.77435	975.4
33	.94736	985.9	67	.87761	978.9			

SUPPLEMENT TO TABLE III.—*Giving specific gravities for temperatures between 0° and 25°, observed by Dr. Recknagel, and reduced to Tralles' standard.*

Per cent.	Specific gravity.			Per cent.	Specific gravity.		
	0°	5°	10°		15°	20°	25°
30	.9772	.9763	.9755	30	.9746	.9737	.9728
31	.9770	.9761	.9751	31	.9741	.9731	.9721
32	.9767	.9757	.9746	32	.9736	.9725	.9714
33	.9762	.9751	.9740	33	.9729	.9717	.9705
34	.9757	.9745	.9733	34	.9721	.9708	.9696
35	.9750	.9738	.9725	35	.9712	.9700	.9687
36	.9744	.9731	.9718	36	.9704	.9690	.9677
37	.9736	.9723	.9709	37	.9695	.9682	.9668
38	.9728	.9714	.9700	38	.9686	.9671	.9656
39	.9719	.9705	.9690	39	.9675	.9659	.9644
40	.9708	.9694	.9678	40	.9663	.9647	.9632
41	.9699	.9683	.9667	41	.9651	.9635	.9619
42	.9687	.9671	.9654	42	.9638	.9621	.9604
43	.9674	.9657	.9640	43	.9624	.9606	.9589
44	.9660	.9643	.9626	44	.9608	.9591	.9573
45	.9645	.9628	.9611	45	.9593	.9576	.9558
46	.9631	.9613	.9596	46	.9578	.9560	.9542
47	.9616	.9598	.9580	47	.9562	.9544	.9526
48	.9600	.9582	.9564	48	.9546	.9528	.9509
49	.9584	.9566	.9548	49	.9529	.9511	.9492
50	.9568	.9549	.9531	50	.9512	.9493	.9474
51	.9551	.9532	.9513	51	.9494	.9475	.9456
52	.9533	.9514	.9495	52	.9476	.9457	.9437
53	.9514	.9495	.9476	53	.9457	.9438	.9418
54	.9496	.9476	.9457	54	.9438	.9418	.9398
55	.9477	.9457	.9438	55	.9418	.9398	.9378
56	.9457	.9437	.9418	56	.9398	.9377	.9357
57	.9436	.9416	.9397	57	.9377	.9357	.9337
58	.9416	.9396	.9377	58	.9357	.9336	.9316
59	.9395	.9375	.9356	59	.9336	.9315	.9295
60	.9375	.9355	.9335	60	.9315	.9294	.9274
61	.9354	.9334	.9314	61	.9294	.9273	.9253
62	.9333	.9313	.9292	62	.9272	.9251	.9231
63	.9312	.9291	.9270	63	.9250	.9229	.9209
64	.9290	.9269	.9248	64	.9228	.9207	.9187
65	.9268	.9247	.9226	65	.9206	.9185	.9164
66	.9246	.9225	.9204	66	.9184	.9162	.9141
67	.9223	.9202	.9181	67	.9161	.9139	.9118
68	.9200	.9179	.9158	68	.9138	.9116	.9095
69	.9177	.9156	.9135	69	.9115	.9093	.9072
70	.9153	.9132	.9111	70	.9091	.9069	.9048
71	.9129	.9108	.9087	71	.9067	.9045	.9024
72	.9105	.9084	.9063	72	.9042	.9020	.8999
73	.9080	.9059	.9038	73	.9017	.8995	.8974
74	.9056	.9034	.9013	74	.8992	.8970	.8948
75	.9031	.9009	.8988	75	.8967	.8945	.8923
76	.9006	.8984	.8963	76	.8942	.8919	.8897
77	.8980	.8958	.8937	77	.8916	.8893	.8871
78	.8954	.8932	.8911	78	.8890	.8867	.8845
79	.8928	.8906	.8884	79	.8863	.8840	.8818
80	.8901	.8879	.8857	80	.8836	.8813	.8791
81	.8874	.8852	.8830	81	.8809	.8786	.8764
82	.8847	.8825	.8803	82	.8782	.8759	.8736
83	.8819	.8797	.8775	83	.8754	.8731	.8708
84	.8790	.8768	.8746	84	.8725	.8702	.8679
85	.8761	.8739	.8717	85	.8696	.8673	.8650
86	.8731	.8709	.8687	86	.8666	.8643	.8621
87	.8701	.8679	.8657	87	.8635	.8612	.8590
88	.8670	.8648	.8626	88	.8604	.8581	.8559
89	.8638	.8616	.8594	89	.8572	.8549	.8527
90	.8606	.8583	.8561	90	.8539	.8516	.8494
91	.8573	.8550	.8528	91	.8506	.8483	.8461
92	.8540	.8517	.8494	92	.8471	.8449	.8427
93	.8506	.8483	.8460	93	.8437	.8415	.8392
94	.8470	.8448	.8425	94	.8402	.8380	.8357
95	.8433	.8411	.8388	95	.8365	.8343	.8320
96	.8394	.8372	.8349	96	.8326	.8304	.8281
97	.8353	.8331	.8308	97	.8284	.8262	.8239
98	.8310	.8287	.8264	98	.8240	.8218	.8195
99	.8264	.8241	.8218	99	.8194	.8172	.8149
100	.8215	.8192	.8169	100	.8145	.8123	.8100

TABLE IV.—*Showing the apparent densities and apparent per cents., corresponding to every true per cent. from 1 to 100, and for every fifth degree of temperature from 30° to 100°.*

Temperature 30°.								
True per cent.	Apparent specific gravity.	Apparent per cent.	True per cent.	Apparent specific gravity.	Apparent per cent.	True per cent.	Apparent specific gravity.	Apparent per cent.
0	.99945	-0.25	34	.96788	26.99	68	.90702	62.50
1	.99866	+0.73	35	.96683	27.97	69	.90457	63.57
2	.99667	1.71	36	.96578	28.91	70	.90214	64.63
3	.99528	2.69	37	.96472	29.84	71	.89972	65.67
4	.99390	3.66	38	.96366	30.77	72	.89723	66.72
5	.99251	4.64	39	.96231	31.87	73	.89473	67.76
6	.99131	5.54	40	.96095	32.98	74	.89218	68.82
7	.99018	6.43	41	.95954	34.07	75	.88962	69.84
8	.98906	7.33	42	.95811	35.13	76	.88704	70.88
9	.98794	8.23	43	.95662	36.22	77	.88442	71.91
10	.98681	9.14	44	.95510	37.27	78	.88180	72.95
11	.98589	9.89	45	.95356	38.33	79	.87912	74.00
12	.98498	10.69	46	.95196	39.40	80	.87642	75.03
13	.98407	11.51	47	.95032	40.46	81	.87369	76.07
14	.98316	12.33	48	.94857	41.55	82	.87093	77.11
15	.98234	13.07	49	.94679	42.63	83	.86816	78.14
16	.98158	13.76	50	.94500	43.69	84	.86528	79.19
17	.98081	14.48	51	.94320	44.73	85	.86231	80.27
18	.98005	15.20	52	.94136	45.78	86	.85934	81.33
19	.97937	15.86	53	.93947	46.84	87	.85627	82.41
20	.97873	16.48	54	.93748	47.91	88	.85314	83.50
21	.97808	17.11	55	.93544	48.99	89	.85001	84.57
22	.97742	17.75	56	.93342	50.07	90	.84673	85.68
23	.97668	18.47	57	.93137	51.12	91	.84334	86.80
24	.97593	19.21	58	.92929	52.15	92	.83995	87.87
25	.97519	19.93	59	.92718	53.19	93	.83638	89.01
26	.97446	20.65	60	.92499	54.25	94	.83272	90.11
27	.97374	21.35	61	.92284	55.29	95	.82887	91.25
28	.97301	22.07	62	.92068	56.31	96	.82479	92.45
29	.97225	22.81	63	.91844	57.36	97	.82061	93.61
30	.97148	23.56	64	.91621	58.39	98	.81642	94.71
31	.97069	24.33	65	.91396	59.41	99	.81201	95.81
32	.96977	25.22	66	.91170	60.42	100	.80745	96.92
33	.96886	26.08	67	.90944	61.43			

Temperature 35°.

0	.99967	-0.40	34	.96661	28.17	68	.90494	63.42
1	.99827	+0.58	35	.96552	29.14	69	.90250	64.48
2	.99687	1.57	36	.96442	30.10	70	.90005	65.53
3	.99547	2.55	37	.96329	31.09	71	.89761	66.56
4	.99407	3.54	38	.96216	31.99	72	.89512	67.60
5	.99268	4.52	39	.96077	33.12	73	.89262	68.63
6	.99146	5.42	40	.95938	34.19	74	.89006	69.67
7	.99031	6.32	41	.95793	35.26	75	.88748	70.70
8	.98917	7.24	42	.95648	36.31	76	.88489	71.73
9	.98802	8.16	43	.95496	37.37	77	.88228	72.76
10	.98688	9.09	44	.95341	38.43	78	.87965	73.79
11	.98591	9.87	45	.95183	39.49	79	.87696	74.83
12	.98497	10.69	46	.95020	40.54	80	.87425	75.86
13	.98403	11.55	47	.94853	41.57	81	.87151	76.89
14	.98308	12.41	48	.94676	42.64	82	.86872	77.94
15	.98222	13.18	49	.94498	43.70	83	.86593	78.96
16	.98141	13.92	50	.94317	44.75	84	.86304	80.01
17	.98059	14.69	51	.94134	45.80	85	.86008	81.07
18	.97978	15.47	52	.93946	46.85	86	.85712	82.11
19	.97904	16.18	53	.93755	47.87	87	.85404	83.19
20	.97832	16.88	54	.93555	48.94	88	.85093	84.26
21	.97762	17.55	55	.93352	50.01	89	.84779	85.32
22	.97690	18.25	56	.93148	51.07	90	.84451	86.42
23	.97610	19.04	57	.92940	52.09	91	.84112	87.50
24	.97530	19.82	58	.92731	53.12	92	.83773	88.58
25	.97450	20.61	59	.92519	54.16	93	.83415	89.68
26	.97370	21.39	60	.92300	55.21	94	.83048	90.77
27	.97292	22.16	61	.92083	56.24	95	.82665	91.90
28	.97213	22.92	62	.91865	57.26	96	.82256	93.09
29	.97130	23.74	63	.91642	58.29	97	.81840	94.19
30	.97045	24.56	64	.91418	59.31	98	.81422	95.26
31	.96960	25.28	65	.91191	60.33	99	.80980	96.35
32	.96863	26.29	66	.90963	61.34	100	.80524	97.44
33	.96765	27.21	67	.90736	62.35			

TABLE IV—Continued.

Temperature 40°.								
True per cent.	Apparent specific gravity.	Apparent per cent.	True per cent.	Apparent specific gravity.	Apparent per cent.	True per cent.	Apparent specific gravity.	Apparent per cent.
0	.99974	-0.45	34	.96530	29.33	68	.90284	64.33
1	.99834	+0.54	35	.96416	30.33	69	.90041	65.38
2	.99693	1.53	36	.96300	31.31	70	.89795	66.42
3	.99554	2.51	37	.96181	32.28	71	.89548	67.45
4	.99414	3.49	38	.96061	33.24	72	.89298	68.49
5	.99274	4.48	39	.95920	34.32	73	.89048	69.50
6	.99150	5.39	40	.95778	35.38	74	.88792	70.52
7	.99033	6.31	41	.95631	36.43	75	.88534	71.55
8	.98917	7.24	42	.95482	37.47	76	.88273	72.58
9	.98801	8.17	43	.95327	38.53	77	.88010	73.61
10	.98685	9.10	44	.95169	39.58	78	.87747	74.63
11	.98586	9.90	45	.95008	40.61	79	.87477	75.66
12	.98488	10.78	46	.94842	41.64	80	.87206	76.68
13	.98390	11.66	47	.94673	42.66	81	.86931	77.72
14	.98292	12.55	48	.94494	43.72	82	.86650	78.75
15	.98202	13.36	49	.94312	44.78	83	.86370	79.77
16	.98116	14.15	50	.94129	45.82	84	.86080	80.81
17	.98029	14.97	51	.93945	46.85	85	.85785	81.85
18	.97943	15.81	52	.93754	47.88	86	.85490	82.89
19	.97863	16.58	53	.93560	48.91	87	.85181	83.96
20	.97786	17.32	54	.93360	49.96	88	.84869	85.02
21	.97708	18.08	55	.93156	51.02	89	.84555	86.08
22	.97630	18.84	56	.92951	52.04	90	.84226	87.14
23	.97544	19.69	57	.92742	53.07	91	.83887	88.22
24	.97458	20.53	58	.92531	54.10	92	.83548	89.28
25	.97372	21.37	59	.92318	55.12	93	.83191	90.35
26	.97287	22.20	60	.92099	56.16	94	.82827	91.42
27	.97203	23.02	61	.91880	57.19	95	.82440	92.56
28	.97118	23.85	62	.91660	58.21	96	.82033	93.69
29	.97028	24.73	63	.91436	59.23	97	.81617	94.77
30	.96937	25.59	64	.91210	60.24	98	.81199	95.82
31	.96844	26.47	65	.90984	61.25	99	.80757	96.89
32	.96742	27.42	66	.90755	62.27	100	.80302	97.96
33	.96639	28.37	67	.90525	63.28			

Temperature 45°.

True per cent.	Apparent specific gravity.	Apparent per cent.	True per cent.	Apparent specific gravity.	Apparent per cent.	True per cent.	Apparent specific gravity.	Apparent per cent.
0	.99974	-0.45	34	.96394	30.52	68	.90070	65.25
1	.99833	+0.54	35	.96275	31.52	69	.89829	66.27
2	.99693	1.53	36	.96154	32.50	70	.89581	67.31
3	.99552	2.52	37	.96028	33.50	71	.89333	68.34
4	.99411	3.51	38	.95902	34.45	72	.89082	69.37
5	.99271	4.50	39	.95759	35.52	73	.88832	70.36
6	.99146	5.42	40	.95616	36.53	74	.88576	71.38
7	.99027	6.35	41	.95465	37.59	75	.88317	72.41
8	.98908	7.31	42	.95313	38.62	76	.88057	73.43
9	.98789	8.27	43	.95155	39.67	77	.87792	74.46
10	.98671	9.22	44	.94994	40.70	78	.87528	75.47
11	.98568	10.05	45	.94829	41.72	79	.87256	76.50
12	.98468	10.96	46	.94661	42.73	80	.86983	77.52
13	.98367	11.87	47	.94489	43.75	81	.86707	78.54
14	.98266	12.78	48	.94308	44.80	82	.86425	79.57
15	.98171	13.65	49	.94125	45.85	83	.86143	80.58
16	.98080	14.49	50	.93940	46.88	84	.85854	81.61
17	.97989	15.36	51	.93753	47.88	85	.85559	82.64
18	.97898	16.24	52	.93560	48.91	86	.85265	83.67
19	.97813	17.06	53	.93363	49.95	87	.84957	84.72
20	.97729	17.87	54	.93162	50.99	88	.84644	85.78
21	.97645	18.70	55	.92957	52.01	89	.84329	86.81
22	.97561	19.52	56	.92751	53.02	90	.84000	87.86
23	.97471	20.40	57	.92540	54.06	91	.83661	88.93
24	.97380	21.29	58	.92328	55.08	92	.83322	89.96
25	.97289	22.19	59	.92113	56.10	93	.82964	91.02
26	.97198	23.07	60	.91894	57.13	94	.82599	92.10
27	.97108	23.95	61	.91674	58.14	95	.82214	93.21
28	.97017	24.83	62	.91453	59.15	96	.81807	94.28
29	.96921	25.75	63	.91228	60.16	97	.81391	95.34
30	.96823	26.66	64	.91002	61.17	98	.80974	96.37
31	.96725	27.58	65	.90773	62.19	99	.80532	97.42
32	.96617	28.56	66	.90542	63.21	100	.80079	98.47
33	.96508	29.53	67	.90310	64.22			

TABLE IV—Continued.

Temperature 50°.								
True per cent.	Apparent specific gravity.	Apparent per cent.	True per cent.	Apparent specific gravity.	Apparent per cent.	True per cent.	Apparent specific gravity.	Apparent per cent.
0	.99962	-0.36	34	.96256	31.67	68	.89854	66.17
1	.99821	+0.63	35	.96131	32.68	69	.89613	67.18
2	.99680	1.62	36	.96006	33.67	70	.89364	68.21
3	.99539	2.61	37	.95873	34.67	71	.89114	69.24
4	.99398	3.60	38	.95741	35.65	72	.88864	70.24
5	.99257	4.60	39	.95596	36.67	73	.88613	71.24
6	.99130	5.54	40	.95449	37.70	74	.88356	72.25
7	.99010	6.50	41	.95295	38.74	75	.88097	73.27
8	.98889	7.46	42	.95140	39.77	76	.87836	74.29
9	.98769	8.43	43	.94979	40.80	77	.87571	75.30
10	.98648	9.40	44	.94816	41.80	78	.87306	76.31
11	.98543	10.28	45	.94648	42.81	79	.87034	77.33
12	.98438	11.23	46	.94476	43.83	80	.86760	78.35
13	.98334	12.17	47	.94302	44.84	81	.86482	79.36
14	.98230	13.11	48	.94119	45.88	82	.86200	80.38
15	.98131	14.01	49	.93934	46.91	83	.85917	81.39
16	.98036	14.91	50	.93747	47.92	84	.85628	82.40
17	.97941	15.82	51	.93558	48.92	85	.85333	83.43
18	.97846	16.74	52	.93362	49.95	86	.85039	84.44
19	.97754	17.63	53	.93164	50.98	87	.84731	85.48
20	.97664	18.51	54	.92962	51.98	88	.84416	86.53
21	.97575	19.38	55	.92756	53.00	89	.84101	87.54
22	.97484	20.28	56	.92547	54.02	90	.83771	88.58
23	.97389	21.21	57	.92337	55.03	91	.83432	89.63
24	.97294	22.13	58	.92123	56.05	92	.83093	90.64
25	.97199	23.06	59	.91908	57.06	93	.82735	91.70
26	.97102	24.01	60	.91687	58.08	94	.82369	92.77
27	.97006	24.94	61	.91466	59.09	95	.81986	93.82
28	.96910	25.85	62	.91243	60.09	96	.81578	94.87
29	.96809	26.79	63	.91017	61.10	97	.81164	95.91
30	.96706	27.76	64	.90790	62.11	98	.80746	96.92
31	.96602	28.70	65	.90561	63.12	99	.80306	97.95
32	.96488	29.70	66	.90329	64.13	100	.79853	98.98
33	.96375	30.69	67	.90095	65.15			

Temperature 55°.

0	.99941	-0.22	34	.96111	32.85	68	.89636	67.08
1	.99799	+0.78	35	.95982	33.85	69	.89395	68.08
2	.99658	1.77	36	.95852	34.83	70	.89145	69.12
3	.99517	2.77	37	.95714	35.85	71	.88895	70.11
4	.99375	3.77	38	.95576	36.81	72	.88643	71.12
5	.99234	4.76	39	.95428	37.85	73	.88391	72.12
6	.99106	5.73	40	.95279	38.85	74	.88134	73.13
7	.98984	6.70	41	.95122	39.89	75	.87874	74.14
8	.98861	7.69	42	.94964	40.89	76	.87612	75.15
9	.98739	8.67	43	.94799	41.91	77	.87347	76.15
10	.98616	9.67	44	.94633	42.90	78	.87081	77.15
11	.98507	10.60	45	.94462	43.91	79	.86808	78.17
12	.98401	11.56	46	.94288	44.92	80	.86533	79.17
13	.98293	12.54	47	.94111	45.93	81	.86255	80.18
14	.98186	13.51	48	.93926	46.96	82	.85973	81.19
15	.98084	14.45	49	.93740	47.95	83	.85689	82.19
16	.97985	15.40	50	.93551	48.96	84	.85400	83.20
17	.97885	16.36	51	.93361	49.96	85	.85105	84.22
18	.97786	17.32	52	.93162	50.99	86	.84811	85.21
19	.97689	18.26	53	.92962	51.99	87	.84502	86.25
20	.97593	19.21	54	.92758	52.99	88	.84187	87.26
21	.97497	20.15	55	.92552	54.00	89	.83872	88.26
22	.97401	21.09	56	.92342	55.01	90	.83542	89.30
23	.97302	22.06	57	.92130	56.02	91	.83203	90.31
24	.97203	23.02	58	.91915	57.03	92	.82864	91.31
25	.97103	24.00	59	.91698	58.03	93	.82506	92.37
26	.97002	24.98	60	.91477	59.04	94	.82141	93.40
27	.96900	25.94	61	.91254	60.04	95	.81758	94.41
28	.96799	26.89	62	.91030	61.04	96	.81315	95.44
29	.96691	27.90	63	.90804	62.05	97	.80936	96.45
30	.96582	28.88	64	.90577	63.05	98	.80518	97.46
31	.96472	29.84	65	.90347	64.06	99	.80077	98.47
32	.96354	30.87	66	.90112	65.08	100	.79625	99.48
33	.96235	31.84	67	.89877	66.07			

TABLE IV—Continued.

Temperature 60°.								
True per cent.	Apparent specific gravity.	Apparent per cent.	True per cent.	Apparent specific gravity.	Apparent per cent.	True per cent.	Apparent specific gravity.	Apparent per cent.
0	.99910	0.00	34	.95963	34.00	68	.89415	68.00
1	.99768	1.00	35	.95829	35.00	69	.89174	69.00
2	.99626	2.00	36	.95693	36.00	70	.88923	70.00
3	.99484	3.00	37	.95549	37.00	71	.88673	71.00
4	.99342	4.00	38	.95406	38.00	72	.88420	72.00
5	.99200	5.00	39	.95256	39.00	73	.88168	73.00
6	.99071	6.00	40	.95106	40.00	74	.87911	74.00
7	.98947	7.00	41	.94946	41.00	75	.87651	75.00
8	.98822	8.00	42	.94784	42.00	76	.87388	76.00
9	.98698	9.00	43	.94616	43.00	77	.87122	77.00
10	.98574	10.00	44	.94447	44.00	78	.86855	78.00
11	.98463	11.00	45	.94274	45.00	79	.86581	79.00
12	.98353	12.00	46	.94098	46.00	80	.86306	80.00
13	.98242	13.00	47	.93918	47.00	81	.86027	81.00
14	.98132	14.00	48	.93731	48.00	82	.85743	82.00
15	.98026	15.00	49	.93543	49.00	83	.85458	83.00
16	.97923	16.00	50	.93353	50.00	84	.85168	84.00
17	.97819	17.00	51	.93161	51.00	85	.84874	85.00
18	.97716	18.00	52	.92959	52.00	86	.84580	86.00
19	.97614	19.00	53	.92756	53.00	87	.84271	87.00
20	.97512	20.00	54	.92552	54.00	88	.83955	88.00
21	.97410	21.00	55	.92344	55.00	89	.83640	89.00
22	.97308	22.00	56	.92134	56.00	90	.83310	90.00
23	.97205	23.00	57	.91921	57.00	91	.82971	91.00
24	.97103	24.00	58	.91705	58.00	92	.82632	92.00
25	.97000	25.00	59	.91487	59.00	93	.82274	93.00
26	.96894	26.00	60	.91264	60.00	94	.81907	94.00
27	.96787	27.00	61	.91040	61.00	95	.81525	95.00
28	.96680	28.00	62	.90815	62.00	96	.81117	96.00
29	.96568	29.00	63	.90589	63.00	97	.80703	97.00
30	.96454	30.00	64	.90360	64.00	98	.80285	98.00
31	.96339	31.00	65	.90130	65.00	99	.79846	99.00
32	.96215	32.00	66	.89894	66.00	100	.79390	100.00
33	.96092	33.00	67	.89656	67.00			

Temperature 65°.								
0	.99869	0.29	34	.95810	35.14	68	.89191	68.93
1	.99727	1.29	35	.95672	36.15	69	.88950	69.89
2	.99584	2.30	36	.95531	37.13	70	.88699	70.90
3	.99441	3.30	37	.95382	38.16	71	.88448	71.89
4	.99299	4.30	38	.95233	39.15	72	.88195	72.89
5	.99156	5.34	39	.95081	40.16	73	.87942	73.88
6	.99026	6.36	40	.94929	41.10	74	.87685	74.87
7	.98899	7.38	41	.94766	42.11	75	.87424	75.86
8	.98774	8.39	42	.94600	43.10	76	.87161	76.85
9	.98648	9.40	43	.94430	44.10	77	.86894	77.85
10	.98522	10.47	44	.94258	45.09	78	.86628	78.83
11	.98408	11.50	45	.94083	46.08	79	.86352	79.83
12	.98296	12.51	46	.93904	47.07	80	.86075	80.83
13	.98182	13.55	47	.93722	48.05	81	.85796	81.81
14	.98069	14.59	48	.93533	49.05	82	.85512	82.81
15	.97959	15.65	49	.93343	50.05	83	.85226	83.80
16	.97852	16.68	50	.93141	51.05	84	.84936	84.79
17	.97745	17.72	51	.92958	52.00	85	.84641	85.79
18	.97638	18.76	52	.92754	53.01	86	.84347	86.75
19	.97530	19.82	53	.92649	54.01	87	.84037	87.74
20	.97422	20.88	54	.92343	55.00	88	.83722	88.74
21	.97315	21.93	55	.92134	56.00	89	.83406	89.71
22	.97207	22.98	56	.91923	56.99	90	.83076	90.69
23	.97101	24.02	57	.91709	57.98	91	.82737	91.69
24	.96996	25.04	58	.91492	58.98	92	.82398	92.69
25	.96890	26.04	59	.91273	59.96	93	.82040	93.67
26	.96779	27.07	60	.91050	60.96	94	.81675	94.62
27	.96668	28.11	61	.90824	61.96	95	.81292	95.59
28	.96556	29.11	62	.90597	62.96	96	.80884	96.58
29	.96489	30.13	63	.90371	63.95	97	.80470	97.56
30	.96320	31.15	64	.90142	64.95	98	.80053	98.53
31	.96200	32.12	65	.89911	65.93	99	.79613	99.51
32	.96072	33.16	66	.89673	66.93	100	.79161	100.49
33	.95944	34.14	67	.89433	67.93			

TABLE IV—Continued.

Temperature 70°.								
True per cent.	Apparent specific gravity.	Apparent per cent.	True per cent.	Apparent specific gravity.	Apparent per cent.	True per cent.	Apparent specific gravity.	Apparent per cent.
0	.99820	0.63	34	.95653	36.28	68	.88965	69.83
1	.99677	1.64	35	.95511	37.27	69	.88722	70.80
2	.99533	2.65	36	.95366	38.27	70	.88471	71.80
3	.99390	3.66	37	.95211	39.30	71	.88220	72.79
4	.99247	4.67	38	.95056	40.31	72	.87966	73.79
5	.99104	5.74	39	.94903	41.27	73	.87713	74.76
6	.98972	6.80	40	.94749	42.21	74	.87455	75.75
7	.98844	7.82	41	.94583	43.20	75	.87194	76.73
8	.98717	8.85	42	.94415	44.19	76	.86931	77.72
9	.98589	9.89	43	.94240	45.19	77	.86663	78.70
10	.98461	11.02	44	.94065	46.18	78	.86396	79.67
11	.98345	12.07	45	.93889	47.16	79	.86120	80.67
12	.98229	13.12	46	.93708	48.12	80	.85843	81.65
13	.98113	14.18	47	.93523	49.11	81	.85564	82.63
14	.97997	15.28	48	.93333	50.10	82	.85280	83.61
15	.97885	16.37	49	.93141	51.10	83	.84994	84.59
16	.97774	17.44	50	.92947	52.06	84	.84703	85.58
17	.97664	18.51	51	.92752	53.02	85	.84408	86.56
18	.97553	19.60	52	.92545	54.03	86	.84113	87.50
19	.97440	20.71	53	.92340	55.02	87	.83803	88.48
20	.97326	21.82	54	.92131	56.01	88	.83488	89.46
21	.97212	22.93	55	.91921	57.00	89	.83172	90.41
22	.97099	24.04	56	.91709	57.98	90	.82841	91.38
23	.96991	25.09	57	.91494	58.97	91	.82502	92.38
24	.96883	26.10	58	.91276	59.95	92	.82163	93.34
25	.96774	27.12	59	.91056	60.93	93	.81805	94.29
26	.96659	28.19	60	.90832	61.92	94	.81438	95.22
27	.96543	29.22	61	.90604	62.93	95	.81056	96.17
28	.96427	30.23	62	.90376	63.93	96	.80650	97.15
29	.96305	31.27	63	.90150	64.91	97	.80234	98.11
30	.96181	32.28	64	.89921	65.89	98	.79818	99.06
31	.96057	33.27	65	.89689	66.86	99	.79378	100.05
32	.95924	34.29	66	.89450	67.85	100	.78927	100.99
33	.95791	35.28	67	.89208	68.86			

Temperature 75°.

True per cent.	Apparent specific gravity.	Apparent per cent.	True per cent.	Apparent specific gravity.	Apparent per cent.	True per cent.	Apparent specific gravity.	Apparent per cent.
0	.99760	1.06	34	.95492	37.40	68	.88736	70.75
1	.99615	2.08	35	.95345	38.41	69	.88493	71.71
2	.99472	3.08	36	.95196	39.40	70	.88241	72.71
3	.99328	4.10	37	.95036	40.44	71	.87990	73.69
4	.99184	5.12	38	.94876	41.43	72	.87736	74.67
5	.99040	6.25	39	.94721	42.38	73	.87482	75.64
6	.98907	7.32	40	.94566	43.30	74	.87223	76.62
7	.98777	8.36	41	.94397	44.29	75	.86962	77.60
8	.98649	9.40	42	.94225	45.28	76	.86698	78.57
9	.98519	10.50	43	.94047	46.28	77	.86431	79.55
10	.98391	11.65	44	.93869	47.26	78	.86163	80.51
11	.98271	12.74	45	.93691	48.21	79	.85886	81.50
12	.98153	13.81	46	.93508	49.18	80	.85610	82.47
13	.98034	14.93	47	.93321	50.17	81	.85330	83.44
14	.97915	16.08	48	.93130	51.15	82	.85045	84.42
15	.97800	17.18	49	.92935	52.12	83	.84759	85.39
16	.97686	18.29	50	.92746	53.08	84	.84468	86.36
17	.97572	19.41	51	.92544	54.04	85	.84172	87.31
18	.97458	20.53	52	.92335	55.04	86	.83876	88.25
19	.97340	21.69	53	.92127	56.03	87	.83566	89.22
20	.97220	22.85	54	.91917	57.02	88	.83251	90.17
21	.97100	24.03	55	.91704	58.00	89	.82935	91.11
22	.96981	25.18	56	.91492	58.98	90	.82605	92.08
23	.96872	26.21	57	.91277	59.94	91	.82265	93.08
24	.96762	27.23	58	.91059	60.91	92	.81926	93.97
25	.96652	28.25	59	.90837	61.90	93	.81567	94.90
26	.96533	29.31	60	.90611	62.90	94	.81201	95.81
27	.96413	30.36	61	.90381	63.91	95	.80818	96.75
28	.96293	31.37	62	.90152	64.90	96	.80413	97.70
29	.96166	32.40	63	.89926	65.86	97	.79997	98.65
30	.96038	33.42	64	.89696	66.83	98	.79580	99.58
31	.95910	34.40	65	.89464	67.80	99	.79141	100.53
32	.95773	35.41	66	.89224	68.79	100	.78690	101.48
33	.95634	36.41	67	.88980	69.77			

TABLE IV—Continued.

Temperature 80°.								
True per cent.	Apparent specific gravity.	Apparent per cent.	True per cent.	Apparent specific gravity.	Apparent per cent.	True per cent.	Apparent specific gravity.	Apparent per cent.
0	.99692	1.53	34	.95328	38.52	68	.88505	71.66
1	.99547	2.50	35	.95177	39.53	69	.88261	72.63
2	.99402	3.58	36	.95022	40.53	70	.88009	73.62
3	.99257	4.60	37	.94857	41.55	71	.87758	74.59
4	.99112	5.68	38	.94692	42.55	72	.87504	75.56
5	.98967	6.84	39	.94536	43.47	73	.87248	76.53
6	.98831	7.93	40	.94379	44.39	74	.86989	77.50
7	.98701	8.98	41	.94207	45.38	75	.86727	78.47
8	.98571	10.03	42	.94032	46.37	76	.86464	79.43
9	.98440	11.21	43	.93850	47.36	77	.86195	80.40
10	.98310	12.39	44	.93669	48.33	78	.85927	81.35
11	.98188	13.49	45	.93490	49.28	79	.85650	82.33
12	.98067	14.61	46	.93305	50.25	80	.85373	83.29
13	.97945	15.79	47	.93116	51.22	81	.85094	84.25
14	.97824	16.95	48	.92923	52.18	82	.84809	85.22
15	.97706	18.10	49	.92727	53.14	83	.84524	86.18
16	.97589	19.25	50	.92530	54.11	84	.84233	87.12
17	.97472	20.39	51	.92333	55.05	85	.83936	88.06
18	.97355	21.54	52	.92121	56.06	86	.83639	89.00
19	.97232	22.74	53	.91912	57.04	87	.83327	89.95
20	.97106	23.97	54	.91699	58.03	88	.83012	90.88
21	.96980	25.19	55	.91485	59.01	89	.82696	91.81
22	.96856	26.35	56	.91272	59.96	90	.82365	92.78
23	.96745	27.39	57	.91056	60.93	91	.82025	93.71
24	.96633	28.42	58	.90836	61.91	92	.81686	94.59
25	.96522	29.40	59	.90614	62.89	93	.81327	95.50
26	.96400	30.47	60	.90388	63.87	94	.80962	96.40
27	.96276	31.51	61	.90157	64.88	95	.80579	97.31
28	.96151	32.52	62	.89926	65.86	96	.80173	98.25
29	.96021	33.55	63	.89700	66.82	97	.79759	99.19
30	.95890	34.54	64	.89470	67.77	98	.79340	100.11
31	.95758	35.52	65	.89238	68.73	99	.78902	101.04
32	.95616	36.53	66	.88996	69.71	100	.78452	101.97
33	.95474	37.52	67	.88750	70.69			

Temperature 85°.

True per cent.	Apparent specific gravity.	Apparent per cent.	True per cent.	Apparent specific gravity.	Apparent per cent.	True per cent.	Apparent specific gravity.	Apparent per cent.
0	.99613	2.09	34	.95157	39.66	68	.88271	72.59
1	.99467	3.12	35	.95002	40.65	69	.88025	73.56
2	.99321	4.15	36	.94844	41.63	70	.87774	74.53
3	.99175	5.19	37	.94675	42.65	71	.87523	75.49
4	.99029	6.34	38	.94505	43.66	72	.87268	76.45
5	.98883	7.51	39	.94347	44.58	73	.87013	77.41
6	.98748	8.60	40	.94189	45.48	74	.86754	78.37
7	.98616	9.67	41	.94014	46.47	75	.86492	79.32
8	.98484	10.81	42	.93836	47.44	76	.86228	80.28
9	.98352	12.01	43	.93650	48.43	77	.85958	81.24
10	.98221	13.19	44	.93466	49.41	78	.85690	82.19
11	.98097	14.33	45	.93287	50.34	79	.85413	83.16
12	.97973	15.51	46	.93100	51.30	80	.85134	84.12
13	.97849	16.71	47	.92908	52.25	81	.84855	85.07
14	.97724	17.92	48	.92713	53.21	82	.84571	86.03
15	.97603	19.11	49	.92517	54.17	83	.84287	86.95
16	.97483	20.28	50	.92318	55.12	84	.83995	87.87
17	.97364	21.45	51	.92119	56.07	85	.83696	88.82
18	.97244	22.62	52	.91905	57.07	86	.83398	89.73
19	.97116	23.87	53	.91694	58.05	87	.83087	90.66
20	.96984	25.15	54	.91478	59.04	88	.82772	91.59
21	.96852	26.39	55	.91262	60.01	89	.82456	92.52
22	.96723	27.60	56	.91048	60.96	90	.82123	93.45
23	.96611	28.62	57	.90834	61.92	91	.81785	94.34
24	.96499	29.61	58	.90614	62.89	92	.81444	95.21
25	.96386	30.59	59	.90390	63.87	93	.81085	96.10
26	.96260	31.64	60	.90162	64.86	94	.80718	96.98
27	.96132	32.67	61	.89930	65.85	95	.80336	97.88
28	.96004	33.68	62	.89697	66.83	96	.79930	98.81
29	.95870	34.69	63	.89471	67.77	97	.79515	99.73
30	.95736	35.68	64	.89242	68.72	98	.79100	100.62
31	.95600	36.65	65	.89009	69.66	99	.78661	101.54
32	.95454	37.66	66	.88766	70.63	100	.78210	102.45
33	.95308	38.65	67	.88518	71.61			

TABLE IV—Continued.

Temperature 90°.								
True per cent.	Apparent specific gravity.	Apparent per cent.	True per cent.	Apparent specific gravity.	Apparent per cent.	True per cent.	Apparent specific gravity.	Apparent per cent.
0	.99525	2.71	34	.94983	40.77	68	.88034	73.52
1	.99377	3.75	35	.94824	41.75	69	.87787	74.48
2	.99231	4.79	36	.94662	42.73	70	.87536	75.44
3	.99084	5.90	37	.94488	43.76	71	.87286	76.38
4	.98937	7.08	38	.94314	44.78	72	.87030	77.34
5	.98790	8.26	39	.94155	45.68	73	.86775	78.29
6	.98653	9.37	40	.93996	46.57	74	.86514	79.24
7	.98519	10.50	41	.93818	47.53	75	.86252	80.19
8	.98387	11.69	42	.93636	48.51	76	.85987	81.14
9	.98254	12.89	43	.93447	49.51	77	.85718	82.09
10	.98121	14.10	44	.93260	50.49	78	.85449	83.03
11	.97995	15.30	45	.93080	51.40	79	.85172	83.99
12	.97868	16.53	46	.92891	52.33	80	.84894	84.93
13	.97742	17.75	47	.92697	53.29	81	.84614	85.88
14	.97616	18.98	48	.92501	54.25	82	.84332	86.80
15	.97492	20.20	49	.92303	55.20	83	.84049	87.70
16	.97370	21.39	50	.92103	56.15	84	.83755	88.63
17	.97247	22.59	51	.91902	57.09	85	.83455	89.56
18	.97124	23.79	52	.91685	58.09	86	.83155	90.46
19	.96991	25.09	53	.91473	59.06	87	.82844	91.37
20	.96853	26.38	54	.91256	60.04	88	.82529	92.30
21	.96716	27.66	55	.91037	61.01	89	.82213	93.21
22	.96582	28.88	56	.90822	61.97	90	.81882	94.09
23	.96469	29.87	57	.90609	62.91	91	.81542	94.96
24	.96356	30.85	58	.90388	63.88	92	.81200	95.82
25	.96243	31.78	59	.90162	64.86	93	.80841	96.69
26	.96114	32.82	60	.89934	65.83	94	.80475	97.56
27	.95983	33.84	61	.89700	66.82	95	.80093	98.44
28	.95851	34.84	62	.89466	67.79	96	.79686	99.35
29	.95714	35.85	63	.89240	68.73	97	.79272	100.25
30	.95577	36.81	64	.89010	69.65	98	.78857	101.13
31	.95438	37.78	65	.88777	70.58	99	.78418	102.03
32	.95288	38.78	66	.88532	71.56	100	.77967	102.94
33	.95138	39.78	67	.88282	72.55			

Temperature 95°.

0	.99428	3.39	34	.94805	41.87	68	.87796	74.44
1	.99280	4.44	35	.94641	42.85	69	.87545	75.40
2	.99132	5.53	36	.94475	43.83	70	.87295	76.35
3	.98983	6.71	37	.94298	44.86	71	.87046	77.28
4	.98835	7.90	38	.94119	45.88	72	.86790	78.24
5	.98687	9.09	39	.93959	46.77	73	.86534	79.17
6	.98548	10.23	40	.93800	47.63	74	.86274	80.12
7	.98413	11.45	41	.93618	48.60	75	.86011	81.06
8	.98279	12.67	42	.93433	49.58	76	.85746	81.99
9	.98145	13.89	43	.93240	50.59	77	.85476	82.94
10	.98011	15.14	44	.93050	51.55	78	.85206	83.87
11	.97883	16.38	45	.92870	52.44	79	.84929	84.81
12	.97754	17.63	46	.92679	53.38	80	.84651	85.76
13	.97625	18.89	47	.92482	54.34	81	.84372	86.67
14	.97497	20.15	48	.92285	55.28	82	.84090	87.57
15	.97371	21.38	49	.92086	56.23	83	.83808	88.47
16	.97246	22.60	50	.91884	57.17	84	.83514	89.38
17	.97121	23.82	51	.91682	58.11	85	.83213	90.29
18	.96996	25.04	52	.91463	59.11	86	.82911	91.18
19	.96858	26.34	53	.91250	60.06	87	.82599	92.09
20	.96716	27.66	54	.91030	61.04	88	.82284	93.02
21	.96573	28.96	55	.90809	62.03	89	.81968	93.86
22	.96434	30.17	56	.90593	62.98	90	.81636	94.72
23	.96320	31.16	57	.90381	63.91	91	.81296	95.58
24	.96207	32.07	58	.90160	64.87	92	.80955	96.41
25	.96094	32.98	59	.89933	65.83	93	.80595	97.27
26	.95962	34.01	60	.89703	66.80	94	.80229	98.13
27	.95828	35.01	61	.89467	67.78	95	.79846	99.00
28	.95693	36.00	62	.89231	68.76	96	.79441	99.89
29	.95553	36.97	63	.89006	69.67	97	.79027	100.77
30	.95413	37.95	64	.88777	70.58	98	.78611	101.64
31	.95272	38.89	65	.88543	71.51	99	.78173	102.53
32	.95118	39.92	66	.88296	72.49	100	.77723	103.42
33	.94964	40.89	67	.88046	73.47			

TABLE IV—Continued.

Temperature 100°.								
True per cent.	Apparent spe- cific gravity.	Apparent per cent.	True per cent.	Apparent spe- cific gravity.	Apparent per cent.	True per cent.	Apparent spe- cific gravity.	Apparent per cent.
0	.99321	4.15	34	.94622	42.96	68	.87553	75.37
1	.99172	5.22	35	.94455	43.95	69	.87301	76.33
2	.99022	6.40	36	.94285	44.94	70	.87053	77.26
3	.98872	7.60	37	.94103	45.97	71	.86804	78.19
4	.98723	8.80	38	.93920	46.99	72	.86549	79.12
5	.98574	10.00	39	.93760	47.85	73	.86292	80.05
6	.98434	11.26	40	.93600	48.70	74	.86031	80.99
7	.98299	12.49	41	.93415	49.67	75	.85768	81.91
8	.98163	13.72	42	.93227	50.66	76	.85502	82.85
9	.98028	14.98	43	.93030	51.65	77	.85231	83.78
10	.97892	16.30	44	.92837	52.60	78	.84962	84.70
11	.97761	17.56	45	.92657	53.49	79	.84685	85.64
12	.97630	18.84	46	.92464	54.42	80	.84407	86.56
13	.97499	20.13	47	.92266	55.38	81	.84128	87.45
14	.97369	21.40	48	.92067	56.31	82	.83847	88.34
15	.97241	22.65	49	.91866	57.26	83	.83567	89.22
16	.97113	23.90	50	.91663	58.19	84	.83272	90.11
17	.96987	25.12	51	.91460	59.12	85	.82969	91.01
18	.96860	26.32	52	.91239	60.11	86	.82666	91.90
19	.96718	27.64	53	.91024	61.07	87	.82352	92.82
20	.96569	28.99	54	.90802	62.06	88	.82037	93.68
21	.96421	30.29	55	.90578	63.05	89	.81721	94.50
22	.96277	31.50	56	.90363	63.99	90	.81390	95.34
23	.96165	32.41	57	.90150	64.91	91	.81049	96.19
24	.96052	33.31	58	.89938	65.81	92	.80708	97.01
25	.95938	34.19	59	.89700	66.82	93	.80347	97.85
26	.95804	35.18	60	.89469	67.78	94	.79989	98.69
27	.95666	36.19	61	.89232	68.76	95	.79597	99.55
28	.95528	37.15	62	.88994	69.72	96	.79191	100.42
29	.95387	38.13	63	.88770	70.61	97	.78778	101.29
30	.95244	39.08	64	.88541	71.52	98	.78362	102.15
31	.95100	40.04	65	.88306	72.45	99	.77926	103.02
32	.94943	41.02	66	.88058	73.43	100	.77475	103.90
33	.94785	41.99	67	.87806	74.40			

SUPPLEMENT TO TABLE IV.—Giving apparent specific gravities and apparent per cent. for temperatures between 0° and 25°, as derived from the supplement to table III.

Temperature 0°.											
True per cent.	Apparent per cent.	Apparent spe- cific gravity.	True per cent.	Apparent per cent.	Apparent spe- cific gravity.	True per cent.	Apparent per cent.	Apparent spe- cific gravity.	True per cent.	Apparent per cent.	Apparent spe- cific gravity.
30	18.9	.9764	48	34.2	.9593	65	53.7	.9261	83	73.2	.8812
31	18.9	.9762	49	35.4	.9577	66	54.8	.9239	84	74.3	.8783
32	19.2	.9759				67	55.9	.9216			
33	19.7	.9754	50	36.6	.9561	68	57.0	.9193	85	75.4	.8754
34	20.2	.9749	51	37.8	.9544	69	58.0	.9170	86	76.6	.8724
			52	39.0	.9526				87	77.7	.8694
35	20.9	.9742	53	40.2	.9507	70	59.1	.9146	88	78.8	.8663
36	21.5	.9736	54	41.3	.9489	71	60.2	.9122	89	80.0	.8631
37	22.3	.9728				72	61.3	.9098			
38	23.1	.9720				73	62.4	.9073	90	81.1	.8599
39	23.9	.9711	55	42.5	.9470	74	63.4	.9049	91	82.3	.8566
			56	43.7	.9450				92	83.4	.8533
40	24.9	.9701	57	44.9	.9429	75	64.5	.9024	93	84.6	.8499
41	25.8	.9692	58	46.0	.9409	76	65.6	.8999	94	85.8	.8464
42	26.9	.9680	59	47.2	.9388	77	66.7	.8973			
43	28.1	.9667				78	67.8	.8947	95	87.0	.8427
44	29.3	.9653	60	48.3	.9368	79	68.9	.8921	96	88.2	.8388
			61	49.4	.9347				97	89.5	.8347
45	30.6	.9638	62	50.5	.9326	80	69.9	.8894	98	90.8	.8304
46	31.8	.9624	63	51.5	.9305	81	71.0	.8867	99	92.1	.8258
47	33.0	.9609	64	52.6	.9283	82	72.1	.8840	100	93.5	.8209

SUPPLEMENT TO TABLE IV—Continued.

Temperature 5°.											
True per cent.	Apparent per cent.	Apparent specific gravity.	True per cent.	Apparent per cent.	Apparent specific gravity.	True per cent.	Apparent per cent.	Apparent specific gravity.	True per cent.	Apparent per cent.	Apparent specific gravity.
30	19.5	.9756	48	35.6	.9575	65	54.7	.9240	83	74.0	.8791
31	19.7	.9754	49	36.7	.9559	66	55.8	.9218	84	75.1	.8762
32	20.1	.9750				67	56.9	.9195			
33	20.7	.9744	50	37.9	.9542	68	57.9	.9172	85	76.2	.8733
34	21.3	.9738	51	39.0	.9525	69	59.0	.9149	86	77.3	.8703
			52	40.2	.9507				87	78.5	.8673
35	22.0	.9731	53	41.4	.9488	70	60.0	.9126	88	79.6	.8642
36	22.7	.9724	54	42.6	.9469	71	61.1	.9102	89	80.7	.8610
37	23.4	.9716				72	62.2	.9078			
38	24.3	.9707				73	63.3	.9053	90	81.9	.8577
39	25.2	.9698	55	43.7	.9450	74	64.3	.9028	91	83.1	.8544
			56	44.8	.9430				92	84.2	.8511
40	26.2	.9687	57	46.0	.9409	75	65.4	.9003	93	85.4	.8477
41	27.3	.9676	58	47.1	.9389	76	66.5	.8978	94	86.5	.8442
42	28.4	.9664	59	48.3	.9368	77	67.6	.8952			
43	29.6	.9650				78	68.6	.8926	95	87.7	.8405
44	30.8	.9636	60	49.3	.9348	79	69.7	.8900	96	88.9	.8366
			61	50.4	.9327				97	90.2	.8325
45	32.0	.9621	62	51.5	.9306	80	70.8	.8873	98	91.5	.8281
46	33.2	.9606	63	52.6	.9284	81	71.8	.8846	99	92.8	.8235
47	34.4	.9591	64	53.7	.9262	82	72.9	.8819	100	94.1	.8186

Temperature 10°.											
True per cent.	Apparent per cent.	Apparent specific gravity.	True per cent.	Apparent per cent.	Apparent specific gravity.	True per cent.	Apparent per cent.	Apparent specific gravity.	True per cent.	Apparent per cent.	Apparent specific gravity.
30	20.2	.9749	48	36.8	.9558	65	55.7	.9220	83	74.9	.8769
31	20.6	.9745	49	37.9	.9542	66	56.7	.9198	84	76.0	.8740
32	21.1	.9740				67	57.8	.9175			
33	21.7	.9734	50	39.0	.9525	68	58.8	.9152	85	77.1	.8711
34	22.3	.9727	51	40.2	.9507	69	59.9	.9129	86	78.2	.8681
			52	41.3	.9489				87	79.3	.8651
35	23.1	.9719	53	42.5	.9470	70	61.0	.9105	88	80.4	.8620
36	23.8	.9712	54	43.6	.9451	71	62.0	.9081	89	81.5	.8588
37	24.7	.9703				72	63.1	.9057			
38	25.6	.9694				73	64.2	.9032	90	82.7	.8555
39	26.5	.9684	55	44.7	.9432	74	65.3	.9007	91	83.8	.8522
			56	45.9	.9412				92	84.9	.8489
40	27.6	.9672	57	47.0	.9391	75	66.3	.8982	93	86.1	.8455
41	28.6	.9661	58	48.1	.9371	76	67.4	.8957	94	87.2	.8420
42	29.8	.9648	59	49.2	.9350	77	68.4	.8931			
43	31.0	.9634				78	69.5	.8905	95	88.4	.8383
44	32.1	.9620	60	50.3	.9329	79	70.6	.8878	96	89.6	.8344
			61	51.4	.9308				97	90.8	.8303
45	33.3	.9605	62	52.5	.9286	80	71.6	.8851	98	92.1	.8259
46	34.5	.9590	63	53.6	.9264	81	72.7	.8824	99	93.4	.8213
47	35.7	.9574	64	54.6	.9242	82	73.8	.8797	100	94.7	.8164

Temperature 15°.											
True per cent.	Apparent per cent.	Apparent specific gravity.	True per cent.	Apparent per cent.	Apparent specific gravity.	True per cent.	Apparent per cent.	Apparent specific gravity.	True per cent.	Apparent per cent.	Apparent specific gravity.
30	21.1	.9740	48	38.0	.9540	65	56.6	.9201	83	75.6	.8749
31	21.6	.9735	49	39.2	.9523	66	57.6	.9179	84	76.7	.8720
32	22.1	.9730				67	58.7	.9156			
33	22.8	.9723	50	40.3	.9506	68	59.7	.9133	85	77.8	.8691
34	23.5	.9715	51	41.3	.9489	69	60.7	.9110	86	78.9	.8661
			52	42.4	.9471				87	80.0	.8630
35	24.4	.9706	53	43.6	.9452	70	61.8	.9086	88	81.1	.8599
36	25.2	.9698	54	44.7	.9433	71	62.9	.9062	89	82.3	.8567
37	26.0	.9689				72	64.0	.9037			
38	26.9	.9680				73	65.0	.9012	90	83.4	.8534
39	27.9	.9669	55	45.8	.9413	74	66.1	.8987	91	84.5	.8501
			56	46.9	.9393				92	85.7	.8466
40	29.0	.9657	57	48.0	.9372	75	67.1	.8962	93	86.8	.8432
41	30.0	.9645	58	49.1	.9352	76	68.2	.8937	94	88.0	.8397
42	31.2	.9632	59	50.2	.9331	77	69.3	.8911			
43	32.3	.9618				78	70.3	.8885	95	89.1	.8360
44	33.6	.9602	60	51.3	.9310	79	71.4	.8858	96	90.3	.8321
			61	52.3	.9289				97	91.5	.8279
45	34.7	.9587	62	53.4	.9267	80	72.4	.8831	98	92.8	.8235
46	35.8	.9572	63	54.5	.9245	81	73.5	.8804	99	94.1	.8189
47	36.9	.9556	64	55.5	.9223	82	74.5	.8777	100	95.3	.8140

SUPPLEMENT TO TABLE IV—Continued.

Temperature 20°.						Temperature 25°.					
True per cent.	Apparent per cent.	Apparent specific gravity.	True per cent.	Apparent per cent.	Apparent specific gravity.	True per cent.	Apparent per cent.	Apparent specific gravity.	True per cent.	Apparent per cent.	Apparent specific gravity.
30	21.9	0.9732	65	57.6	0.9180	30	22.7	0.9724	65	58.5	0.9160
31	22.5	.9726	66	58.6	.9157	31	23.3	.9717	66	59.5	.9137
32	23.1	.9720	67	59.7	.9134	32	24.0	.9710	67	60.6	.9114
33	23.8	.9712	68	60.7	.9111	33	24.9	.9701	68	61.6	.9091
34	24.7	.9703	69	61.7	.9088	34	25.8	.9692	69	62.6	.9068
35	25.5	.9695	70	62.8	.9064	35	26.6	.9683	70	63.7	.9044
36	26.4	.9685	71	63.8	.9040	36	27.5	.9673	71	64.7	.9020
37	27.2	.9677	72	64.9	.9015	37	28.4	.9664	72	65.8	.8995
38	28.2	.9666	73	66.0	.8990	38	29.4	.9652	73	66.8	.8970
39	29.2	.9654	74	67.0	.8965	39	30.5	.9640	74	67.9	.8944
40	30.3	.9642	75	68.1	.8940	40	31.5	.9628	75	68.9	.8919
41	31.3	.9630	76	69.1	.8914	41	32.5	.9615	76	70.0	.8893
42	32.4	.9616	77	70.2	.8888	42	33.7	.9600	77	71.0	.8867
43	33.6	.9601	78	71.2	.8862	43	34.8	.9585	78	72.0	.8841
44	34.8	.9586	79	72.3	.8835	44	36.0	.9569	79	73.1	.8814
45	35.9	.9571	80	73.3	.8808	45	37.1	.9554	80	74.2	.8787
46	37.0	.9555	81	74.4	.8782	46	38.2	.9538	81	75.2	.8760
47	38.1	.9539	82	75.4	.8755	47	39.2	.9522	82	76.3	.8732
48	39.2	.9523	83	76.5	.8727	48	40.3	.9505	83	77.3	.8704
49	40.3	.9506	84	77.5	.8698	49	41.4	.9488	84	78.4	.8675
50	41.4	.9488	85	78.6	.8669	50	42.5	.9470	85	79.4	.8646
51	42.5	.9470	86	79.7	.8639	51	43.6	.9452	86	80.5	.8617
52	43.6	.9452	87	80.8	.8608	52	44.7	.9433	87	81.6	.8586
53	44.7	.9433	88	81.9	.8577	53	45.8	.9414	88	82.7	.8555
54	45.8	.9413	89	83.0	.8545	54	46.9	.9394	89	83.8	.8523
55	46.9	.9393	90	84.1	.8512	55	48.0	.9374	90	84.9	.8490
56	48.1	.9372	91	85.3	.8479	56	49.1	.9353	91	86.0	.8457
57	49.1	.9352	92	86.4	.8445	57	50.1	.9333	92	87.1	.8423
58	50.2	.9331	93	87.5	.8411	58	51.2	.9312	93	88.2	.8388
59	51.3	.9310	94	88.6	.8376	59	52.2	.9291	94	89.3	.8353
60	52.3	.9289	95	89.8	.8339	60	53.3	.9270	95	90.4	.8316
61	53.4	.9268	96	90.9	.8300	61	54.3	.9249	96	91.6	.8277
62	54.4	.9246	97	92.2	.8258	62	55.4	.9227	97	92.8	.8235
63	55.5	.9224	98	93.4	.8214	63	56.4	.9205	98	94.0	.8191
64	56.5	0.9202	99	94.6	.8168	64	57.4	0.9183	99	95.2	.8145
			100	95.8	0.8119				100	96.4	0.8096

EXPERIMENTS MADE AT THE SURGEON GENERAL'S OFFICE, UNITED STATES ARMY, IN WASHINGTON CITY.

The apparatus with which experiments were made on the specific gravity of alcohol at temperatures below 32° Fahrenheit, consisted essentially of a glass bulb loaded with mercury and suspended from the arm of a balance, a brass can to contain the liquid under examination, and a small tub in which the can was placed and surrounded by a freezing mixture.

This can or cup was prolonged below into a tube through which passed a rod carrying a screw-shaped stirrer, by means of which rapid currents could be excited in the liquid, and its uniformity of temperature insured. The rod was turned by a multiplying wheel which could give a rapidity of motion much in excess of what was actually required.

The brass can, which was $7\frac{1}{4}$ inches deep by $3\frac{1}{2}$ in diameter, was immersed in the freezing mixture to about half an inch from its top, and was filled with alcohol to within about one inch of the same level, leaving an empty space above of some ten cubic inches. It was closed by a tightly fitting brass cover, in which were inserted three tubes open at both ends; one large one in the centre

through which passed the fine wire by which the plunger was suspended, and one small one on each side. Through one of these smaller tubes an accurate thermometer was inserted, and the other was connected by means of an India-rubber tube with a half gallon bottle which contained a small quantity of strong sulphuric acid, and served as a reservoir of desiccated air.

One of the main difficulties which presented itself in considering the question of accurate determination of specific gravities at low temperatures was this, that when the spirit was cooled below the dew point of the atmosphere, moisture would begin to condense on its surface so that its composition would be continually changing by the absorption of water, the rapidity of change depending upon the humidity of the air and the amount of it which came into contact with the alcohol.

It was unavoidable that there should be an empty space over the alcohol in the can, and that this space should communicate with the external air; but in order to hinder the freedom of admixture, the communication was made through a tube of some length and capacity; and further, by means of a hand pump, small quantities of air which had been dried in the sulphuric acid bottle were from time to time introduced into the air space of the can. That this device was effective, was ascertained by observing that while moisture was thickly deposited on the outside of the can, sometimes in the form of ice, none could be detected on its inner surface, even where most exposed to the external atmosphere.

During the latter part of the experiments a lining of thick blotting paper was pasted on the inside of the cover of the can, to act as an absorbent of any moisture that might deposit. This precaution was apparently superfluous as long as the injection of air from the sulphuric acid bottle was attended to.

The glass bulb used in the experiments weighed in air 54.064 grammes, and when immersed in distilled water at 60° , 1.602. It displaced, therefore, 52.462 grammes of distilled water at 60° , and to this weight the densities as determined were referred.

The general course of experiment was to introduce the alcohol into the can to determine its density at some moderate temperature, and then to fill around it with a mixture of salt and pounded ice and to stir the alcohol frequently until it had reached its lowest temperature, which it did in from one and a half to two hours, when the thermometer ceased to fall and remained stationary for some time; the stirring was then intermitted and the immersed plunger weighed. The temperature then beginning to rise slowly, requiring about three hours to change from zero to 32° , the operation of weighing was repeated from time to time until a series of weighings had been made at temperatures below 32° .

The day's work was then generally finished by removing a part of the ice from the tub and adding enough warm water to raise the temperature to that included in the ordinary tables. A final weighing of the immersed plunger then gave the means of determining whether the spirit had altered its density during the course of the day.

The freezing mixture used in the tub was in all cases broken ice and salt. It was put in until its level was at or a little above the level of the alcohol, and was occasionally stirred up, a thermometer being used to make certain that no great difference of temperature existed between its top and bottom.

The rate of rise of temperature in the freezing mixture was, as has been previously stated, about a degree Fahrenheit in six minutes. While a rapid motion of the stirrer was kept up, the alcohol in the can closely followed this change, and the temperature of the glass bulb could not have lagged behind to any material extent. Upon the cessation of motion a condition of stable temperature would result, lasting until currents of convection caused by the increasing heat of the freezing mixture had been established in the alcohol.

This temporary condition of stability enabled the plunger to be weighed with sufficient accuracy, that is to within the error which would result from the variation of a twentieth of a degree Fahrenheit.

The balance used was capable of indicating one-fifth of a milligramme, but as the variation of one degree Fahrenheit caused a change of more than two centigrammes in the apparent weight of the plunger, errors of weighing not greater than a milligram were disregarded.

Date.	Weight of bulb in air.	Thermometer.	Barometer.	Attached thermometer.	Date.	Weight of bulb in dis-tilled water.	Temperature.
	<i>Gram.</i>	<i>°</i>				<i>Gram.</i>	
April 10, 1868	54.064	64	30.11	72	March 5, 1868	1.599	59.5
April 29, 1868	54.064	64	30.19	64	March 5, 1868	1.602	60.0
April 30, 1868	54.064	71.5	29.95	75	March 6, 1868	1.611	61.7
March 13, 1868	54.065	75	29.95	75	March 6, 1868	1.607	60.5
	54.065	70.5	30.00	75	March 6, 1868	1.651	69.5
					March 6, 1868	1.712	79.0
					March 6, 1868	1.794	89.9
					March 6, 1868	1.788	89.0
					March 6, 1868	1.653	70.0
					March 7, 1868	1.575	50.0
					March 7, 1868	1.570	39.2
					March 7, 1868	1.584	32.0

NOTE.—Mean weight of bulb in air corrected for buoyancy of air = 54.1212 grammes. Mean weight of water displaced by bulb, at temperature 39°.4 Fah., = 52.568 grammes.

60 PER CENT. OF ALCOHOL—APPROXIMATE.

Date.	Wt. of bulb in mixture.	Temperature of mixture.	Specific gravity.	Date.	Wt. of bulb in mixture.	Temperature of mixture.	Specific gravity.
1868.	<i>Gram.</i>			1868.	<i>Gram.</i>		
April 11	6.442	72	0.9070	April 21	5.305	20	0.9286
	4.929	1.6	.9358		5.300	20	.9287
	4.917	1	.9360		5.449	27	.9259
	4.908	0.5	.9361		5.556	32	.9239
April 14	6.491	74.5	.9061		5.788	43	.9195
	6.428	71.7	.9073		6.365	69	.9085
	4.929	1.7	.9358	April 22	6.491	74.8	.9061
	5.000	5.1	.9342	11.00 A. M.	6.463	73.5	.9066
	6.430	71.9	.9072	11.45	5.180	14.9	.9312
April 20	6.356	68.7	.9086	11.55	5.050	8.2	.9335
	4.913	1.2	.9361	12.05 P. M.	4.994	5.5	.9345
	4.907	1.0	.9362	12.10	4.964	4	.9351
	4.891	0.1	.9365	12.15	4.934	2.5	.9357
	4.885	0	.9366	12.20	4.922	1.5	.9359
	4.886	0	.9366	12.25	4.906	1	.9362
	5.132	12	.9319	1.35	4.886	0	.9366
	5.153	13	.9315	2.00	5.300	20	.9287
	5.200	15	.9306	2.15	5.486	29	.9252
	5.559	32	.9238	2.25	5.506	30	.9248
	6.334	67.7	.9091	2.35	5.635	36	.9223
April 21	6.356	68.7	.9086	2.50	5.720	40	.9207
	5.080	10	.9329	3.00	5.930	50	.9168
	4.990	5	.9346	3.20	6.222	63	.9112
	5.196	15	.9307	3.40	6.200	62	.9116
	5.284	19.1	.9290				

55 PER CENT. OF ALCOHOL—APPROXIMATE.

Date.	Wt. of bulb in mixture.	Temperature of mixture.	Specific grav- ity.	Date.	Wt. of bulb in mixture.	Temperature of mixture.	Specific grav- ity.
1868.	Gram.			1868.	Gram.		
April 23, P. M.	5.951	75	0.9163	April 27, 2 P. M.	4.683	15	0.9404
2.30	5.664	62	.9218	2.30	4.580	10	.9424
April 24, A. M.	5.776	67	.9197	2.45	4.602	11	.9420
11.30	4.372	-0.5	.9464	3.15	4.705	16	.9400
11.45	4.359	-1.3	.9466	April 29, P. M.	5.720	65	.9207
12.	4.389	0	.9461	12.45	4.440	3.5	.9451
12.10 P. M.	4.408	+1	.9457	1.15	4.533	8.8	.9433
2.15	4.694	15.3	.9402	2.	4.590	11	.9422
2.45	4.787	20	.9384	2.15	4.675	15	.9403
3.45	5.032	32	.9338	2.40	4.730	18	.9392
4.	5.904	72.9	.9172	3.30	5.413	51	.9266
April 25, A. M.	5.763	66.6	.9199	April 30, A. M.	5.861	71.8	.9181
11.30	4.426	2	.9454	1 P. M.	4.505	7	.9438
12.	4.403	1	.9458	1.45	4.564	10	.9427
12.20 P. M.	4.388	0	.9461	2.	4.585	11	.9423
2.	4.845	23.5	.9374	2.20	4.605	12	.9419
2.30	4.988	30	.9347	2.30	4.623	13	.9416
3.	5.665	62	.9218	2.40	4.642	14	.9413
April 27, P. M.	5.885	72.1	.9176	2.50	4.662	15	.9409
1.	4.444	3	.9450	3.	4.683	16	.9405
1.10	4.461	4	.9447	3.10	4.702	17	.9401
1.30	4.482	5	.9443	3.20	4.721	18	.9397

82 PER CENT. OF ALCOHOL—APPROXIMATE.

March 27	9.481	68.1	0.8511	March 27, 2.10 P. M.	7.887	0	0.8795
	7.881	-0.1	.8796	2.30	7.887	0	.8795
	7.857	-1.1	.8801		9.501	69	.8488
	7.838	-2.2	.8804	March 28, A. M.	9.344	62.8	.8518
	7.847	-1.6	.8803	P. M.	8.100	9.8	.8752
	7.850	-1.5	.8803		8.101	10.1	.8752
	7.863	-1	.8801		8.082	9	.8758
	7.862	-1	.8801		8.448	25	.8691
1.15 P. M.	7.900	+1	.8793		9.389	64.8	.8509

40 PER CENT. OF ALCOHOL—APPROXIMATE.

May 20, 2.15 P. M.	4.147	60	0.9507	June 10, 1.55 P. M.	3.236	6	0.9680
May 21, P. M.	4.275	66.9	.9482	2.10	3.253	7	.6677
1.40	3.172	1	.9692	2.20	3.267	8	.9674
2.10	3.330	11	.9662	2.35	3.293	10	.9669
2.20	3.340	12	.9660	2.50	3.456	20	.9638
2.35	3.355	13	.9657	3.30	3.663	33	.9599
2.45	3.373	14	.9654	June 11, A. M.	4.313	70	.9475
3.	3.389	15	.9651	11.55	3.280	9	.9671
3.15	4.149	60	.9506	12.25 P. M.	3.309	11	.9666
June 9, A. M.	4.435	76	.9452	12.35	3.325	12	.9663
10.50	3.263	7.5	.9675	12.45	3.340	13	.9660
	3.298	10	.9668	12.55	3.355	14	.9657
	3.460	20.5	.9637	1.05	3.367	15	.9655
2.40 P. M.	3.491	22.5	.9631	1.20	3.367	15	.9655
3.15	3.509	23.5	.9628	1.50	3.385	16	.9652
June 10, A. M.	4.386	73.5	.9461	2.	3.400	17	.9649
12 M.	3.143	0	.9698	2.10	3.415	18	.9646
12.30 P. M.	3.143	0	.9697	3.	3.448	20	.9640
1 P. M.	3.160	1	.9694	3.30	3.639	32	.9603
1.10	3.178	2	.9691	3.50	4.126	60	.9511
1.30	3.206	4	.9686	June 12, 10.30 A. M.	4.124	60	.9511
1.45	3.220	5	.9683				

WASHINGTON, *July* 21, 1866.

SIR : The committee of the National Academy of Sciences, appointed in pursuance of your request, under date of February 15, to advise the Treasury Department on the best mode of proving and gauging distilled spirits, have the honor to submit the accompanying report, together with an instrument and book of tables, which they recommend to be used in the inspection of spirits. The preparation of the latter has somewhat delayed the presentation of this report.

The conclusions reached and recommendations submitted, are briefly as follows :

ON PROVING THE STRENGTH OF SPIRITS.

1. In conformity with the general usage of distillers, rectifiers, and dealers in spirits, the strength of spirituous liquors, in levying duties, should be estimated according to their equivalent of proof-spirit, defined to be that alcoholic liquor which contains one-half of its volume of absolute alcohol.

2. Instead of using the terms *above* and *below* proof, the *percentage* of proof-spirit contained in liquor should be stated, and the hydrometers should be graduated accordingly. Proof-spirits will thus be indicated by 100 on the scale, alcohol by 200, water by 0. The per cents. of alcohol contained in the liquor will be represented by just one-half the numbers indicating the per cents. of proof-spirits, and will be identical with those of the "Tralles" scale.

3. The hydrometers should be made of glass, and graduated to indicate true per cents. of proof spirit, when the liquor is at a temperature of 60° Fahr. Of a great variety of patterns submitted, the committee give the preference to that presented by Mr. G. Tagliabue, of New York, who has made the accompanying instrument in accordance with their views.

It consists of five separate hydrometers in series, covering the whole range from water to alcohol, and so arranged that for the inspection of any particular class of liquors, only one of them is required. They are compact, of moderate size, and not easily broken. The scales are very open and afford great accuracy and facility in reading. Each set is accompanied by a copper case or cup, for containing the liquor, with an attached thermometer.

4. A table is herewith presented to be used in connection with the hydrometers, giving the true per cents. of proof-spirit for any indication of the hydrometer at temperatures between 0° and 100 Fahr. This table is so full as to leave no computation for fractions to be made; the required value is at once found by inspection, and in proving a particular lot of spirits all the entries required will in general be found on the same page.

5. The hydrometers should be tested by an officer of the government, and, as no stamp can be placed upon them, should be manufactured with a label on the inside of the bulb, designating them as government standards: those that will not bear the test to be broken. The hydrometers and tables should be issued to inspectors by the Internal Revenue Bureau, either with or without charge for their cost, as may be deemed best.

The committee recommend that the government issue them free of charge, with a certain allowance for breakage, the excess over which should be paid for by the inspector. It is understood that the full set of hydrometers with a cup and thermometer, packed in a neat box, can be supplied at a cost of twenty dollars, (\$20;) single hydrometers to supply breakage at \$2 50.

ON GAUGING THE QUANTITY OF SPIRITS.

6. As the volume of a given quantity of spirits varies considerably with the temperature, it is obvious that the duty should be assessed upon the number of gallons it occupies at the average temperature of 60° Fahr. All methods of measuring or gauging the contents of casks being somewhat uncertain, while their weight is readily ascertained and not variable with the temperature, the committee recommend that, instead of gauging, the quantity of spirits should be estimated by means of their weight. With that view they submit table II, of the manual, which gives the number of gallons corresponding to different weight and strength of spirits.

7. As it may not be practicable to introduce at once the system of weighing the casks, and they will continue to be gauged, a column for reducing the

volume measure at any temperature to its equivalent at 60° Fahr., is given in table I, in conjunction with the true per cents. The use of this table should be enjoined.

8. For the information of inspectors and manufacturers a short table is added to the manual giving the specific gravity for each degree of strength of spirits, and the relative proportions of alcohol and water contained.

MEANS OF PREVENTING FRAUD.

9. The committee confidently believe that a *spirit meter* can be constructed which will register the quantity of spirits passing from a still, and afford a reliable check on the distiller and inspector.

They recommend that an instrument based upon the principle of Worthington's water-meter be constructed and submitted to trial.

10. Of various inventions submitted for measuring and registering the quantity of spirits passing from a still, the only one which has commended itself for simplicity and certainty of action, is that of Cox & Murphy, of Montreal, which the committee likewise recommend to be submitted to actual trial in a distillery, for several months, under the supervision of an officer of the revenue.

All of which is respectfully submitted by—

JOSEPH HENRY,
M. C. MEIGS,
J. E. HILGARD,

Committee of the National Academy of Sciences.

Hon. HUGH McCULLOCH,
Secretary of the Treasury.

TREASURY DEPARTMENT, *August 1, 1866.*

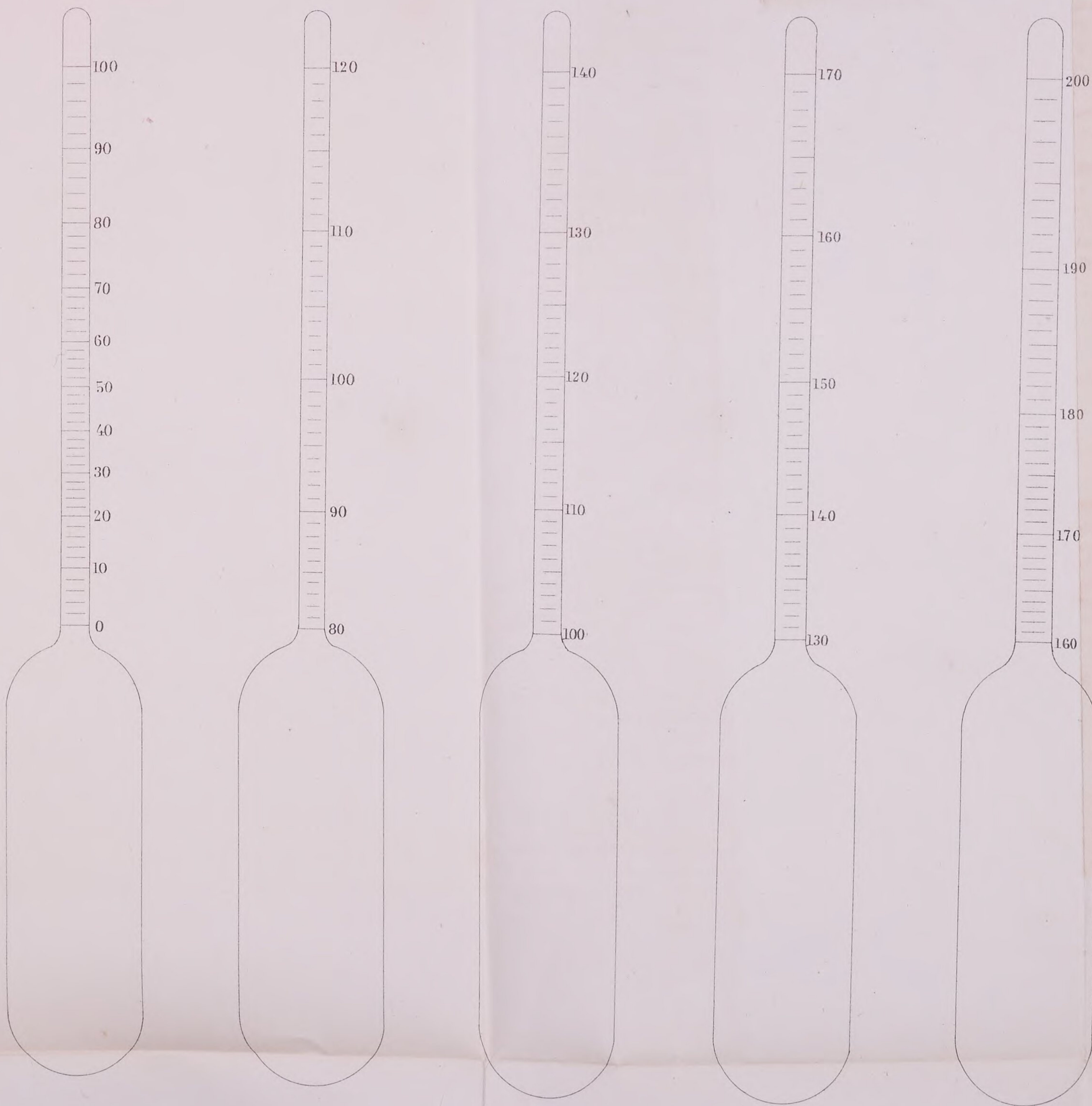
SIR: I am directed by the Secretary to acknowledge the receipt of the report of the committee of the National Academy of Sciences, appointed in pursuance of my request of February 15, to advise this department on the best mode of proving and gauging distilled spirits. The Secretary further instructs me to return you his thanks for the information and advice contained in the report in question.

Respectfully yours,

WM. E. CHANDLER,
Assistant Secretary.

Professor JOSEPH HENRY,
Smithsonian Institute.

Hydrometers indicating percents by volume of Proof Spirits at 60° Fahr.



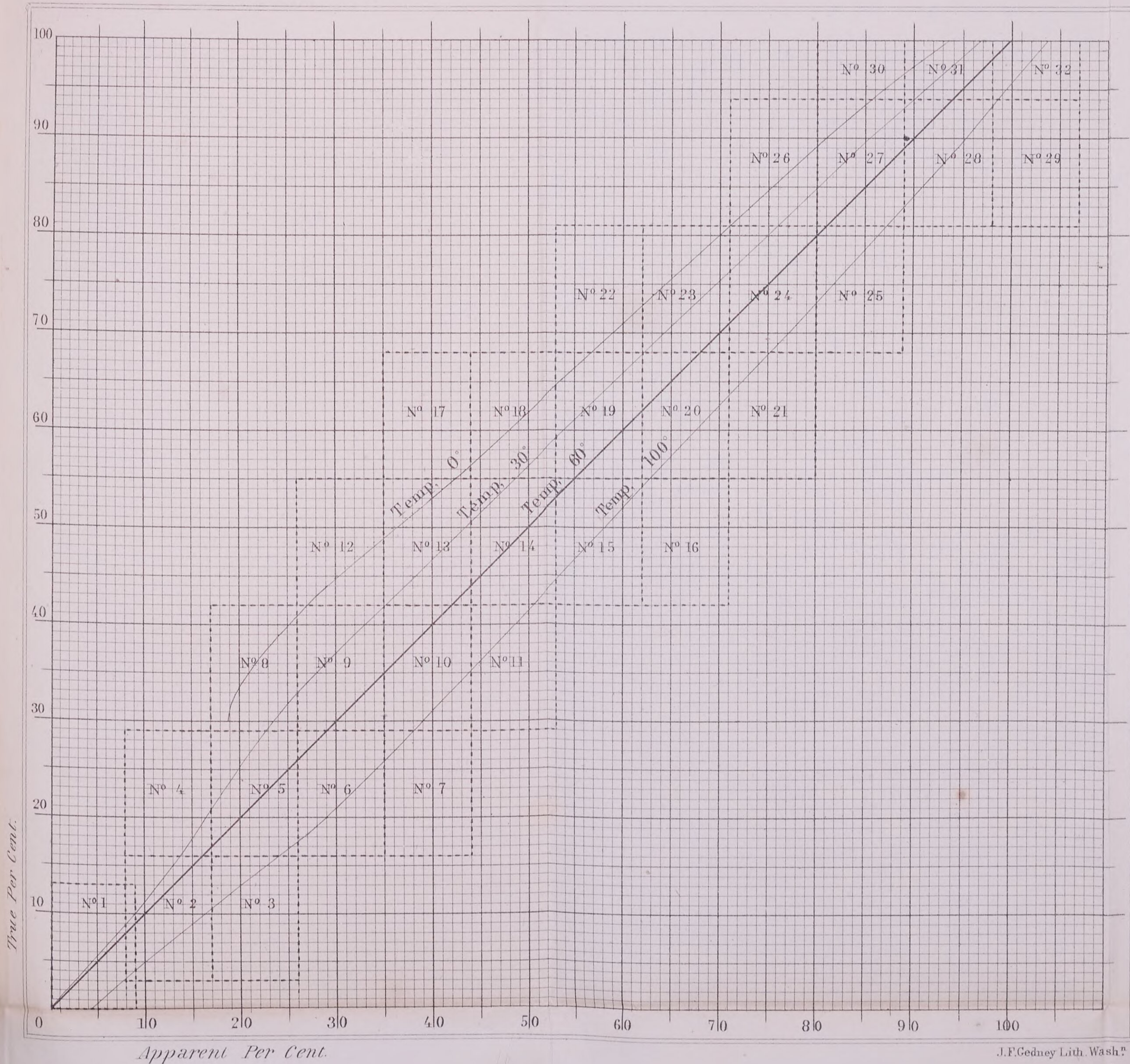
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Scheme of Sheets for Conversion of True into Apparent Per Cent—Alcohol.

Plate 2



J.F.Gedney Lith. Wash.ⁿ

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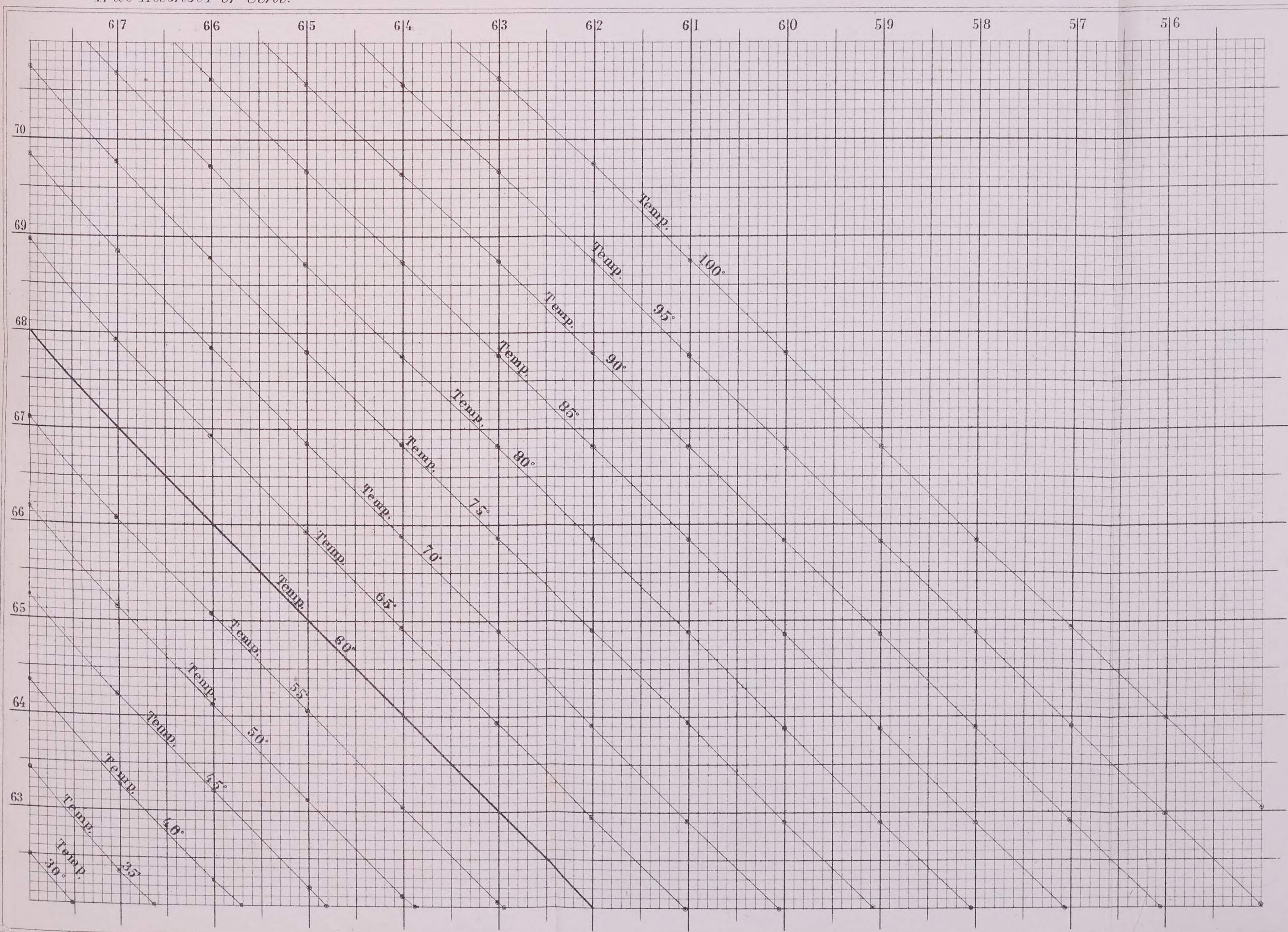
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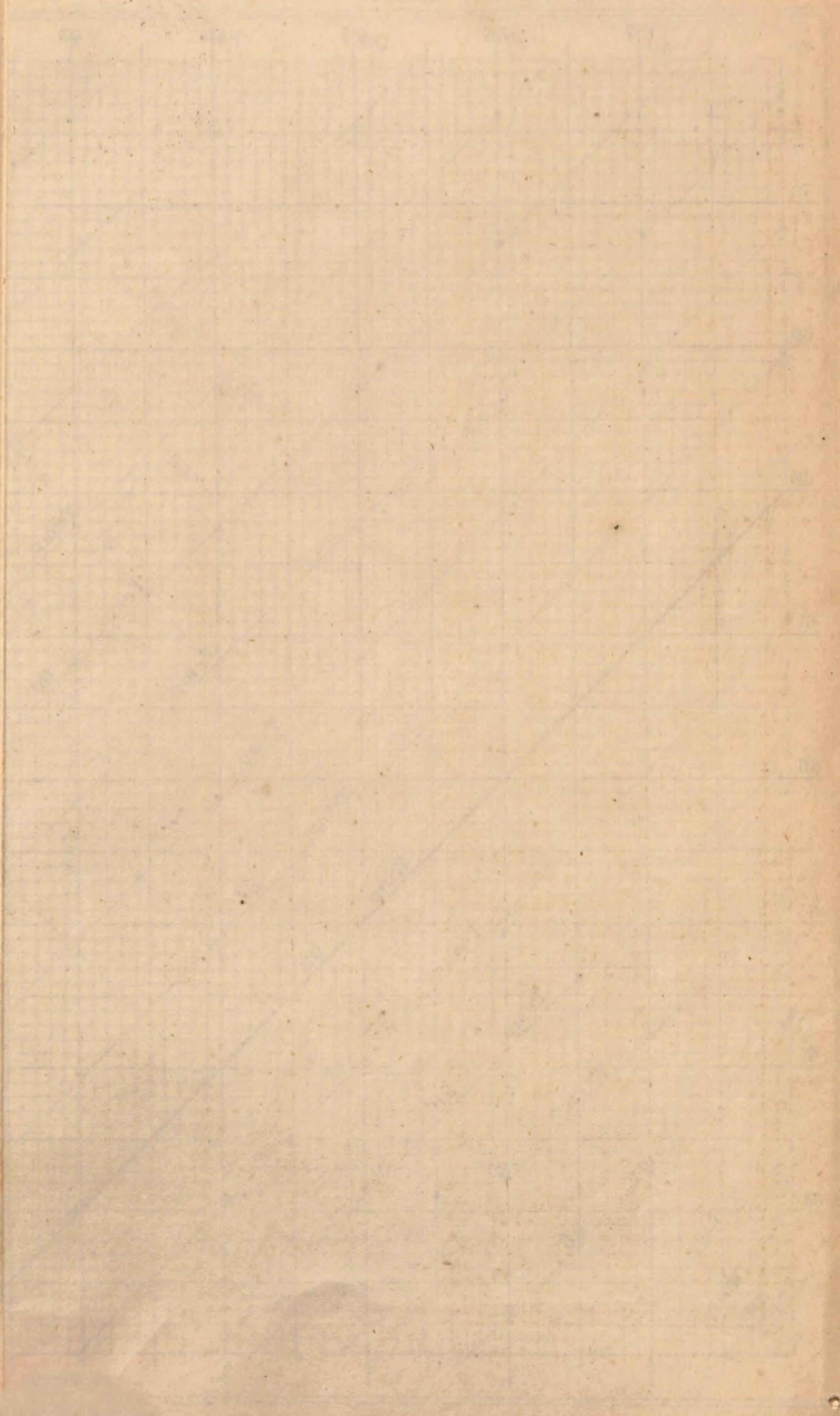
Specimen Sheet for Conversion of True into Apparent Per Cent.

True Alcohol Per Cent.



J.F. Gedney Lith.

THE UNIVERSITY OF CHICAGO
LIBRARY



Temperature corrections for a hydrometer

Showing per-cent of Proof spirit at 60° Fahr.

CORRECTIONS FOR TEMPERATURE

	Percent			Temp.	Percent			Temp.
	80	90	100		110	120	130	
SUBTRACT	100°			100°		16		100°
		17				15		
			16			14		
		15				13		
			14			12		
	90	13		90		11		90
		12				10		
		11				9		
		10				8		
	80	9		80		7		80
SUBTRACT		8				6		
		7				5		
		6				4		
		5				3		
	70	4		70		2		70
		3				1		
		2				0		
		1						
	60	0		60				60
ADD		1				1		
		2				2		
		3				3		
		4				4		
	50	5		50		5		50
		6				6		
		7				7		
		8				8		
	40	9		40		9		40
		10				10		
ADD		11				11		
		12				12		
	30	13		30		13		30
		14				14		
		15				15		
		16				16		
	20	17		20		17		20
		18				18		
		19				19		
	10	20		10		20		10
ADD		21				21		
		22				22		
		23				23		
		24				24		
	0	25		0		25		0

CORRECTIONS FOR TEMPERATURE

	Percent			Temp.	Percent			Temp.
	140	150	160		170	180	190	
SUBTRACT	100°	15		100°	13	12		100°
		14						
		13				11	10	
		12				9		
	90	11		90		8	7	90
		10				7		
		9				6	5	
	80	8		80		5	4	80
		7				4	3	
		6				3		
SUBTRACT		5				2		
		4				1		
	70	3		70		0		70
		2						
		1						
	60	0		60				60
		1						
		2						
		3						
ADD	50	4		50		3		50
		5				2		
		6				1		
		7				0		
	40	8		40				40
		9						
		10						
		11						
	30	12		30				30
		13						
ADD		14						
		15						
		16						
	20	17		20				20
		18						
		19						
		20						
		21						
	10	22		10				10
		23						
ADD		24						
		25						
	0			0				0

MANUAL FOR INSPECTORS OF SPIRITS.

EXPLANATION OF THE TABLES, AND DIRECTIONS FOR THEIR USE.

TABLE I.—TRUE PER CENT.

Proof-spirit is defined by law to be that mixture of alcohol and water which contains one-half of its volume of alcohol; the alcohol when at a temperature of 60° Fahr. being of specific gravity 0.79390, referred to water at its maximum density as unity. Proof-spirit has, at 60° Fahr., a specific gravity of 0.93353, 100 parts by volume of the same consisting of 50 parts of absolute alcohol and 53.71 parts of water. The difference of the sum of the parts of alcohol and water, and the resulting 100 parts of proof-spirit, is due to the contraction which takes place when alcohol and water combine.

As the law declares that "the duties on all spirits shall be levied according to their equivalent in proof-spirits," the hydrometers furnished to the inspectors are so graduated as to indicate the number of parts by volume of proof-spirit equivalent to 100 parts of the liquor *at the standard temperature of 60° Fahr.*; thus they read 0 for water, 100 for proof-spirit, and 200 for absolute alcohol.

It is seldom, however, that the liquor is inspected at 60° Fahr.; and as its density varies with the temperature, a correction is necessary for a temperature differing from 60° , the hydrometer giving too low an indication for temperatures below 60° , and one too high for those above. This correction, applied to the indication of the hydrometer, gives the *true per cent.*, or what the reading of the hydrometer would be were the liquor at 60° .

Table I has been prepared accordingly, and exhibits the true per cents by volume of proof-spirit for such indications of the hydrometer at temperatures between 0° and 100° Fahr. as are likely to occur in practice. The left-hand column, headed "Indication," contains the reading of the hydrometer, and on the same horizontal line, in the body of the table, in the "Temperature" column indicated by the thermometer, is found the corrected reading or true per cent.

The table is computed for tenths of a per cent.; but in practice only the nearest whole number of a per cent. need be used, excepting when large quantities are proved at one operation, in which case the decimal must be retained; otherwise, in taking out true per cents, if the decimal is .5 or less, drop it; if it is .6 or over, add a unit. Thus, page 11, column 23° , indication 123, the true per cent., 136.5, is called 136. Same page and column, indication 141, the true per cent., 153.6, is called 154.

Examples.—The hydrometer reads 130, the thermometer 29° ; on page 11, in the temperature column 29° , and opposite indication 130, we find 141, which is the true per cent. of proof-spirit in the liquor. This is the same as 41 *over proof*, according to the ordinary way of speaking.

Suppose the hydrometer reads 150 and the thermometer 85° ; on page 29, in temperature column 85° , and against indication 150, we again find 141 for the true per cent.

It may happen that the hydrometer indicates the strength as under proof when it is really over, and *vice versa*.

Examples.—The hydrometer reads 89, the thermometer 29° . On page 10, column 29° , indication 89, we find the true per cent. 102, or 2 *over proof*.

The hydrometer reads 103, the thermometer 86° . On page 28, column 86° , indication 103, we find the true per cent. to be 92, or 8 *under proof*.

VOLUMES.

The correction required to reduce 100 gallons, measured at any temperature, to its volume at the standard temperature, 60° Fahr., is given in table of corrections to volume, page 33.

As the volumes contract with a decrease and expand with an increase of temperature, below 60° the correction is to be added, and above 60° to be subtracted.

Examples.—Suppose the cask was gauged at the time it was inspected, and that at 30° it contained 121.4 gallons, while the hydrometer read 135. For temperature 30°, and opposite indication 135, (page 33,) we find the correction to volume 1.5, “*add*”

Gallons gauged.....	121.4
1 per cent.....	+ 1.2
.5 per cent.....	+ .6
Gallons at 60° Fahr.....	123.2

Suppose that at 85° it contained 124.8 gallons, while hydrometer reads 155. For temperature 85°, and opposite indication 155, (page 33,) we find the correction to volume 1.3, “*subtract*”

Gallons gauged.....	124.8
1 per cent.....	— 1.2
.3 per cent.....	— .4
Gallons at 60° Fahr.....	123.2

The above show that at 60° Fahr. the cask contains 123.2 gallons of spirits and of strength 146, as will be found from table I. In order to find the equivalent number of gallons of proof-spirit multiply 123.2 by 1.46, which may be done thus with the least number of figures :

Multiply by 1.....	123.2
Multiply by 4, and set back 1 digit.....	49.2[8]
Multiply by 6, and set back 2 digits	7.3[92]
	179.8[72]

The result shows a larger volume of proof-spirit than the actual volume of liquor in the cask. This is because the liquor being of strength 146 is *over* proof, and would require the addition of water to reduce it to proof.

TABLE II.

This is a table for gauging by means of the weight of the liquor and the true per cent. The following example fully illustrates its use:

Example.—A cask of spirit of 141 per cent. strength (or 41 over proof) weighed 913 pounds net. We find—

900 pounds equal to.....	121.54 gallons
10 pounds equal to	1.35 gallons
3 pounds equal to.....	.40 gallons
Or contents	123.29

that is, 913 pounds of spirit of strength 141 is equivalent to 123.3 gallons at 60° Fahr.

The equivalent gallons for 10 pounds are found from the column 100 pounds

by moving the decimal point one place to the left; those for 3 pounds from the column 300 pounds by moving the decimal point two places to the left.

TABLE III

Gives the respective volumes of absolute alcohol and water contained in 100 volumes of spirits of different strength, and also the specific gravities of the mixtures, referred, for convenience, to the density of water at 60° Fahr. as unity.

This table will be found especially useful in reducing the strength of liquors by a definite amount.

To do this divide the alcohol in the given strength by the alcohol in the required strength, multiply the quotient by the water in the required strength, and subtract the water in the given strength from the product. The remainder is the number of gallons of water to be added to 100 gallons of liquor of the given strength to produce a liquor of the required strength.

Example.—It is required to reduce liquor of 141 per cent. to proof.

We find on page 38, 141 per cent. contains 70.5 parts alcohol, and 32.86 parts water.

Page 37, 100 per cent. contains 50.0 parts alcohol, and 53.71 parts water.

Alcohol in 141 per cent.....	70.50
------------------------------	-------

Divide by alcohol in 100 per cent. = 50.00.....	1.41
---	------

Multiply by water in 100 per cent. = 53.71—

50.....	70.50
3.....	4.23
.7.....	.99
.01.....	.01

75.73

Subtract water in 141 per cent. =.....	32.86
--	-------

Gallons of water to add to 100 gallons of 141 per cent.....	42.87
---	-------

or, to 100 gallons of 141 per cent. add 42.9 gallons of water, and the mixture will be proof-spirit.

This rule is generally applicable for reducing to any per cent.; but when it is required to reduce to 100 per cent., it is sufficient to multiply the given per cent. by 53.71, and deduct the water in the given strength. Thus in the above example—

$$1.41 \times 53.71 - 32.86 = 75.73 - 32.86 = 42.87.$$

by moving the decimal point one place to the left; then the 2 pounds from the 2000 pounds by moving the decimal point two places to the left.

TABLE III

Give the respective volumes of absolute alcohol and water contained in 100 volumes of spirit of different strengths, and also the specific gravity of the mixture. It is assumed that the density of water at 60° F. is 0.99987. This table will be found especially useful in reducing the strength of spirits to a definite amount.

To do this divide the alcohol in the given strength by the alcohol in the required strength, multiply the quotient by the water in the required strength, and subtract the water in the given strength from the product. The remainder is the number of gallons of water to be added to 100 gallons of spirit of the given strength to produce a spirit of the required strength.

Example.—It is required to reduce 100 parts of 141 per cent. to proof. We find on page 86, 141 per cent. contains 70.5 parts alcohol and 29.5 parts water.

Page 87, 100 per cent. contains 50.0 parts alcohol and 50.0 parts water.

Divide by alcohol in 100 per cent. = 50.00

Multiply by water in 100 per cent. = 50.00

..... 50.00

..... 50.00

..... 50.00

..... 50.00

..... 50.00

..... 50.00

..... 50.00

..... 50.00

..... 50.00

..... 50.00

..... 50.00

..... 50.00

..... 50.00

..... 50.00

..... 50.00

..... 50.00

..... 50.00

..... 50.00

..... 50.00

TABLE I.

SHOWING

TABLE I.

SHOWING

THE TRUE PER CENTS OF PROOF-SPIRIT

FOR ANY

INDICATION OF THE HYDROMETER AT TEMPERATURES
BETWEEN 0° AND 100° FAHR.

[illegible]

TRUE PER CENT.

Ind. 51 to 120.

Temp. 1° to 10°.

Indication.	TEMPERATURES.									
	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°
51	80.8	80.2	79.7	79.1	78.6	78.0	77.4	76.9	76.3	75.7
52	81.8	81.2	80.7	80.1	79.6	79.0	78.5	77.9	77.4	76.8
53	82.7	82.1	81.6	81.0	80.5	80.0	79.5	78.9	78.4	77.9
54	83.6	83.1	82.5	82.0	81.5	81.0	80.5	79.9	79.4	78.9
55	84.4	83.9	83.4	82.9	82.4	81.9	81.4	80.8	80.3	79.8
56	85.3	84.8	84.3	83.8	83.3	82.8	82.3	81.8	81.3	80.8
57	86.2	85.7	85.1	84.6	84.1	83.6	83.1	82.7	82.2	81.7
58	87.0	86.5	86.0	85.5	85.0	84.5	84.0	83.6	83.1	82.6
59	87.8	87.3	86.9	86.4	85.9	85.4	84.9	84.5	84.0	83.5
60	88.6	88.1	87.7	87.2	86.7	86.2	85.7	85.3	84.8	84.3
61	89.4	89.0	88.5	88.1	87.6	87.1	86.6	86.2	85.7	85.2
62	90.2	89.8	89.3	88.9	88.4	87.9	87.5	87.0	86.6	86.1
63	91.0	90.6	90.1	89.7	89.2	88.7	88.3	87.8	87.4	86.9
64	91.9	91.4	91.0	90.5	90.1	89.6	89.1	88.7	88.2	87.7
65	92.7	92.3	91.8	91.4	90.9	90.4	90.0	89.5	89.1	88.6
66	93.5	93.1	92.6	92.2	91.7	91.2	90.8	90.3	89.9	89.4
67	94.3	93.9	93.4	93.0	92.5	92.1	91.6	91.2	90.7	90.3
68	95.2	94.7	94.3	93.8	93.3	92.9	92.5	92.0	91.6	91.2
69	96.0	95.6	95.1	94.7	94.2	93.8	93.3	92.9	92.4	92.0
70	96.8	96.4	95.9	95.5	95.0	94.6	94.2	93.7	93.3	92.9
71	97.7	97.3	96.8	96.4	95.9	95.5	95.1	94.6	94.2	93.8
72	98.5	98.1	97.6	97.2	96.7	96.3	95.9	95.5	95.1	94.7
73	99.4	98.9	98.5	98.0	97.6	97.2	96.8	96.3	95.9	95.5
74	100.3	99.8	99.4	98.9	98.5	98.1	97.7	97.2	96.8	96.4
75	101.1	100.6	100.2	99.7	99.3	98.9	98.5	98.1	97.7	97.3
76	101.9	101.5	101.0	100.6	100.2	99.8	99.4	98.9	98.5	98.1
77	102.8	102.4	101.9	101.5	101.1	100.7	100.3	99.8	99.4	99.0
78	103.6	103.2	102.7	102.3	101.9	101.5	101.1	100.7	100.3	99.9
79	104.5	104.1	103.6	103.2	102.8	102.4	102.0	101.6	101.2	100.8
80	105.3	104.9	104.4	104.0	103.6	103.2	102.8	102.5	102.1	101.7
81	106.2	105.8	105.3	104.9	104.5	104.1	103.7	103.4	103.0	102.6
82	107.0	106.6	106.2	105.8	105.4	105.0	104.6	104.3	103.9	103.5
83	107.9	107.5	107.0	106.6	106.2	105.8	105.4	105.1	104.7	104.3
84	108.7	108.3	107.9	107.5	107.1	106.7	106.3	106.0	105.6	105.2
85	109.6	109.2	108.8	108.4	108.0	107.6	107.2	106.9	106.5	106.1
86	110.4	110.0	109.6	109.2	108.8	108.4	108.0	107.7	107.3	106.9
87	111.2	110.8	110.5	110.1	109.7	109.3	108.9	108.6	108.2	107.8
88	112.1	111.7	111.3	110.9	110.5	110.1	109.8	109.4	109.1	108.7
89	112.9	112.5	112.2	111.8	111.4	111.0	110.7	110.3	110.0	109.6
90	113.8	113.4	113.0	112.6	112.2	111.8	111.5	111.1	110.8	110.4
91	114.7	114.3	113.9	113.5	113.1	112.7	112.4	112.0	111.7	111.3
92	115.6	115.2	114.8	114.4	114.0	113.6	113.3	112.9	112.6	112.2
93	116.5	116.1	115.7	115.3	114.9	114.5	114.2	113.8	113.5	113.1
94	117.4	117.0	116.6	116.2	115.8	115.4	115.1	114.7	114.4	114.0
95	118.3	117.9	117.5	117.1	116.7	116.3	116.0	115.6	115.3	114.9
96	119.2	118.8	118.4	118.0	117.6	117.2	116.9	116.5	116.2	115.8
97	120.1	119.7	119.3	118.9	118.5	118.1	117.8	117.4	117.1	116.7
98	121.0	120.6	120.2	119.8	119.4	119.0	118.7	118.3	118.0	117.6
99	121.9	121.5	121.1	120.7	120.3	119.9	119.6	119.2	118.9	118.5
100	122.8	122.4	122.0	121.6	121.2	120.8	120.5	120.1	119.8	119.4
101	123.7	123.3	122.9	122.5	122.1	121.7	121.4	121.0	120.7	120.3
102	124.6	124.2	123.9	123.5	123.1	122.7	122.4	122.0	121.7	121.3
103	125.5	125.1	124.8	124.4	124.0	123.6	123.3	122.9	122.6	122.2
104	126.4	126.0	125.7	125.3	124.9	124.4	124.1	123.8	123.5	123.1
105	127.3	126.9	126.6	126.2	125.8	125.4	125.1	124.7	124.4	124.0
106	128.3	127.9	127.5	127.1	126.7	126.3	126.0	125.6	125.3	124.9
107	129.2	128.8	128.4	128.0	127.6	127.2	126.9	126.5	126.2	125.8
108	130.1	129.7	129.3	128.9	128.5	128.1	127.8	127.4	127.1	126.7
109	131.0	130.6	130.3	129.9	129.5	129.1	128.8	128.4	128.1	127.7
110	131.9	131.6	131.2	130.9	130.5	130.1	129.8	129.4	129.1	128.7
111	132.8	132.5	132.1	131.8	131.4	131.0	130.7	130.3	130.0	129.6
112	133.8	133.4	133.1	132.7	132.3	132.0	131.6	131.3	130.9	130.6
113	134.7	134.4	134.0	133.7	133.3	132.9	132.6	132.2	131.9	131.5
114	135.6	135.3	134.9	134.6	134.2	133.9	133.5	133.2	132.8	132.5
115	136.6	136.2	135.9	135.5	135.2	134.9	134.5	134.2	133.8	133.5
116	137.6	137.2	136.9	136.5	136.1	135.8	135.4	135.1	134.7	134.4
117	138.5	138.1	137.8	137.4	137.1	136.8	136.4	136.1	135.7	135.4
118	139.4	139.0	138.7	138.3	138.0	137.7	137.3	137.0	136.6	136.3
119	140.4	140.0	139.7	139.3	139.0	138.7	138.3	138.0	137.6	137.3
120	141.3	140.9	140.6	140.2	139.9	139.6	139.2	138.9	138.5	138.2

TRUE PER CENT.

Ind. 121 to 189.

Temp. 1° to 10°.

Indication.	TEMPERATURES.									
	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°
121	142.2	141.9	141.5	141.2	140.9	140.6	140.2	139.9	139.5	139.2
122	143.1	142.8	142.4	142.1	141.8	141.5	141.1	140.8	140.4	140.1
123	144.1	143.8	143.4	143.1	142.8	142.5	142.1	141.8	141.4	141.1
124	145.0	144.7	144.3	144.0	143.7	143.4	143.0	142.7	142.3	142.0
125	145.9	145.6	145.3	145.0	144.7	144.4	144.0	143.7	143.3	143.0
126	146.9	146.6	146.2	145.9	145.6	145.3	144.9	144.6	144.2	143.9
127	147.8	147.5	147.1	146.8	146.5	146.2	145.8	145.5	145.1	144.8
128	148.7	148.4	148.0	147.7	147.4	147.1	146.7	146.4	146.0	145.7
129	149.6	149.3	148.9	148.6	148.3	148.0	147.7	147.3	147.0	146.7
130	150.6	150.3	149.9	149.6	149.3	149.0	148.6	148.3	147.9	147.6
131	151.5	151.2	150.8	150.5	150.2	149.9	149.5	149.2	148.8	148.5
132	152.4	152.1	151.7	151.4	151.1	150.8	150.4	150.1	149.7	149.4
133	153.3	153.0	152.6	152.3	152.0	151.7	151.4	151.0	150.7	150.4
134	154.2	153.9	153.6	153.3	153.0	152.7	152.3	152.0	151.6	151.3
135	155.2	154.9	154.5	154.2	153.9	153.6	153.2	152.9	152.5	152.2
136	156.1	155.8	155.4	155.1	154.8	154.5	154.1	153.8	153.4	153.1
137	157.1	156.8	156.4	156.1	155.8	155.5	155.1	154.8	154.4	154.1
138	158.0	157.7	157.3	157.0	156.7	156.4	156.0	155.7	155.3	155.0
139	158.9	158.6	158.2	157.9	157.6	157.3	156.9	156.6	156.2	155.9
140	159.8	159.5	159.1	158.8	158.5	158.2	157.9	157.5	157.2	156.9
141	160.8	160.5	160.1	159.8	159.5	159.2	158.8	158.5	158.1	157.8
142	161.7	161.4	161.0	160.7	160.4	160.1	159.7	159.4	159.0	158.7
143	162.6	162.3	161.9	161.6	161.3	161.0	160.7	160.3	160.0	159.7
144	163.6	163.2	162.9	162.5	162.2	161.9	161.6	161.2	160.9	160.6
145	164.5	164.2	163.8	163.5	163.2	162.9	162.6	162.2	161.9	161.6
146	165.3	165.0	164.7	164.4	164.1	163.8	163.5	163.1	162.8	162.5
147	166.2	165.9	165.6	165.3	165.0	164.7	164.4	164.0	163.7	163.4
148	167.1	166.8	166.5	166.2	165.9	165.6	165.3	164.9	164.6	164.3
149	168.0	167.7	167.4	167.1	166.8	166.5	166.2	165.9	165.6	165.3
150	168.9	168.6	168.3	168.0	167.7	167.4	167.1	166.8	166.5	166.2
151	169.8	169.5	169.2	168.9	168.6	168.3	168.0	167.7	167.4	167.1
152	170.7	170.4	170.1	169.8	169.5	169.2	168.9	168.6	168.3	168.0
153	171.6	171.3	171.0	170.7	170.4	170.1	169.8	169.5	169.2	168.9
154	172.5	172.2	171.9	171.6	171.3	171.0	170.7	170.4	170.1	169.8
155	173.3	173.1	172.8	172.6	172.3	172.0	171.7	171.3	171.0	170.7
156	174.2	174.0	173.7	173.5	173.2	172.9	172.6	172.2	171.9	171.6
157	175.1	174.9	174.6	174.4	174.1	173.8	173.5	173.2	172.9	172.6
158	176.0	175.8	175.5	175.3	175.0	174.7	174.4	174.1	173.8	173.5
159	176.9	176.7	176.4	176.2	175.9	175.6	175.3	175.0	174.7	174.4
160	177.8	177.6	177.3	177.1	176.8	176.5	176.2	175.9	175.6	175.3
161	178.7	178.5	178.2	178.0	177.7	177.4	177.1	176.8	176.5	176.2
162	179.6	179.4	179.1	178.9	178.6	178.3	178.0	177.7	177.4	177.1
163	180.4	180.2	179.9	179.7	179.4	179.1	178.8	178.6	178.3	178.0
164	181.1	181.1	180.8	180.6	180.3	180.0	179.7	179.5	179.2	178.9
165	182.1	181.9	181.6	181.4	181.1	180.8	180.5	180.3	180.0	179.7
166	183.0	182.8	182.5	182.3	182.0	181.7	181.4	181.2	180.9	180.6
167	183.8	183.6	183.3	183.1	182.8	182.5	182.3	182.0	181.8	181.5
168	184.7	184.4	184.2	183.9	183.7	183.4	183.2	182.9	182.7	182.4
169	185.5	185.3	185.0	184.8	184.5	184.2	184.0	183.7	183.5	183.2
170	186.4	186.1	185.9	185.6	185.4	185.1	184.9	184.6	184.4	184.1
171	187.2	186.9	186.7	186.4	186.2	186.0	185.8	185.5	185.2	185.0
172	188.0	187.8	187.5	187.3	187.0	186.8	186.5	186.3	186.0	185.8
173	188.9	188.6	188.4	188.1	187.9	187.7	187.4	187.2	186.9	186.7
174	189.7	189.5	189.2	189.0	188.7	188.5	188.2	188.0	187.7	187.5
175	190.6	190.3	190.1	189.8	189.6	189.4	189.1	188.9	188.6	188.4
176	191.4	191.2	190.9	190.7	190.5	190.3	190.0	189.8	189.5	189.3
177	192.3	192.0	191.8	191.5	191.3	191.1	190.9	190.6	190.4	190.2
178	193.1	192.9	192.6	192.4	192.2	192.0	191.8	191.5	191.3	191.1
179	193.9	193.7	193.4	193.2	193.0	192.8	192.6	192.3	192.1	191.9
180	194.7	194.5	194.2	194.0	193.8	193.6	193.4	193.2	193.0	192.8
181	195.4	195.2	194.9	194.7	194.5	194.3	194.1	193.9	193.7	193.5
182	196.2	196.0	195.7	195.5	195.3	195.1	194.9	194.7	194.5	194.3
183	196.9	196.7	196.4	196.2	196.0	195.8	195.6	195.5	195.3	195.1
184	197.6	197.4	197.2	197.0	196.8	196.6	196.4	196.3	196.1	195.9
185	198.3	198.1	197.9	197.7	197.5	197.3	197.1	197.0	196.8	196.6
186	199.1	198.9	198.7	198.5	198.3	198.1	197.9	197.8	197.6	197.4
187	199.8	199.6	199.5	199.3	199.1	198.9	198.7	198.6	198.4	198.2
188				200.0	199.8	199.6	199.4	199.3	199.1	198.9
189									199.9	199.7

TRUE PER CENT.

Ind. 51 to 120.

Temp. 11° to 20°.

Indication.	TEMPERATURES.									
	11°	12°	13°	14°	15°	16°	17°	18°	19°	20°
51	75.1	74.5	74.0	73.4	72.8	72.2	71.7	71.1	70.6	70.0
52	76.2	75.7	75.1	74.6	74.0	73.4	72.9	72.3	71.8	71.2
53	77.3	76.8	76.2	75.7	75.1	74.5	74.0	73.4	72.9	72.3
54	78.3	77.8	77.2	76.7	76.1	75.6	75.0	74.5	73.9	73.4
55	79.3	78.8	78.2	77.7	77.2	76.7	76.1	75.6	75.0	74.5
56	80.3	79.8	79.2	78.7	78.2	77.7	77.2	76.6	76.1	75.6
57	81.2	80.7	80.1	79.6	79.1	78.6	78.1	77.6	77.1	76.6
58	82.1	81.6	81.1	80.6	80.1	79.6	79.1	78.6	78.1	77.6
59	83.0	82.5	82.0	81.5	81.0	80.5	80.0	79.6	79.1	78.6
60	83.8	83.3	82.9	82.4	81.9	81.4	80.9	80.5	80.0	79.5
61	84.7	84.2	83.8	83.3	82.8	82.3	81.8	81.4	80.9	80.4
62	85.6	85.1	84.7	84.2	83.7	83.2	82.7	82.3	81.8	81.3
63	86.4	85.9	85.5	85.0	84.5	84.0	83.6	83.1	82.7	82.2
64	87.2	86.8	86.3	85.9	85.4	84.9	84.5	84.0	83.6	83.1
65	88.1	87.6	87.2	86.7	86.2	85.8	85.3	84.9	84.4	84.0
66	88.9	88.4	88.0	87.5	87.0	86.6	86.1	85.7	85.2	84.8
67	89.8	89.3	88.9	88.4	87.9	87.5	87.0	86.6	86.1	85.7
68	90.7	90.2	89.8	89.3	88.8	88.4	87.9	87.5	87.0	86.6
69	91.5	91.0	90.6	90.1	89.6	89.2	88.8	88.3	87.9	87.5
70	92.4	91.9	91.5	91.0	90.5	90.1	89.7	89.2	88.8	88.4
71	93.3	92.8	92.4	91.9	91.4	91.0	90.6	90.1	89.7	89.3
72	94.2	93.7	93.3	92.8	92.3	91.9	91.5	91.0	90.6	90.2
73	95.0	94.6	94.1	93.7	93.2	92.8	92.4	91.9	91.5	91.1
74	95.9	95.5	95.0	94.6	94.1	93.7	93.3	92.8	92.4	92.0
75	96.8	96.4	95.9	95.5	95.0	94.6	94.2	93.7	93.3	92.9
76	97.7	97.3	96.8	96.4	95.9	95.5	95.1	94.6	94.2	93.8
77	98.6	98.2	97.7	97.3	96.8	96.4	96.0	95.5	95.1	94.7
78	99.5	99.1	98.6	98.2	97.7	97.3	96.9	96.4	96.0	95.6
79	100.4	100.0	99.5	99.1	98.6	98.2	97.8	97.3	96.9	96.5
80	101.3	100.9	100.4	100.0	99.5	99.1	98.7	98.2	97.8	97.4
81	102.2	101.8	101.3	100.9	100.5	100.1	99.6	99.2	98.7	98.3
82	103.1	102.7	102.2	101.8	101.4	101.0	100.5	100.1	99.6	99.2
83	103.9	103.5	103.1	102.7	102.3	101.9	101.5	101.0	100.6	100.2
84	104.8	104.4	104.0	103.6	103.2	102.8	102.4	101.9	101.5	101.1
85	105.7	105.3	104.9	104.5	104.1	103.7	103.3	102.8	102.4	102.0
86	106.5	106.1	105.8	105.4	105.0	104.6	104.2	103.7	103.3	102.9
87	107.4	107.0	106.7	106.3	105.9	105.5	105.1	104.6	104.2	103.8
88	108.3	107.9	107.6	107.2	106.8	106.4	106.0	105.5	105.1	104.7
89	109.2	108.8	108.5	108.1	107.7	107.3	106.9	106.4	106.0	105.6
90	110.0	109.7	109.3	109.0	108.6	108.2	107.8	107.3	106.9	106.5
91	110.9	110.6	110.2	109.9	109.5	109.1	108.7	108.2	107.8	107.4
92	111.8	111.5	111.1	110.8	110.4	110.0	109.6	109.1	108.7	108.3
93	112.7	112.4	112.0	111.7	111.3	110.9	110.5	110.0	109.6	109.2
94	113.6	113.3	112.9	112.6	112.2	111.8	111.4	111.0	110.6	110.2
95	114.5	114.2	113.8	113.5	113.1	112.7	112.3	111.9	111.5	111.1
96	115.4	115.1	114.7	114.4	114.0	113.6	113.2	112.8	112.4	112.0
97	116.3	116.0	115.6	115.3	114.9	114.5	114.1	113.7	113.3	112.9
98	117.2	116.9	116.5	116.2	115.8	115.4	115.0	114.7	114.3	113.9
99	118.1	117.8	117.4	117.1	116.7	116.3	115.9	115.6	115.2	114.8
100	119.1	118.7	118.4	118.0	117.7	117.3	116.9	116.5	116.1	115.7
101	120.0	119.6	119.3	118.9	118.6	118.2	117.8	117.5	117.1	116.7
102	120.9	120.6	120.2	119.9	119.5	119.1	118.7	118.4	118.0	117.6
103	121.8	121.5	121.1	120.8	120.4	120.0	119.6	119.3	118.9	118.5
104	122.7	122.4	122.0	121.7	121.3	120.9	120.5	120.2	119.8	119.4
105	123.6	123.3	122.9	122.6	122.2	121.8	121.4	121.1	120.7	120.3
106	124.5	124.2	123.8	123.5	123.1	122.7	122.4	122.0	121.7	121.3
107	125.5	125.1	124.8	124.4	124.1	123.7	123.3	123.0	122.6	122.2
108	126.4	126.0	125.7	125.3	125.0	124.6	124.2	123.9	123.5	123.1
109	127.4	127.0	126.7	126.3	126.0	125.6	125.2	124.9	124.5	124.1
110	128.3	128.0	127.6	127.3	126.9	126.5	126.1	125.8	125.4	125.0
111	129.3	128.9	128.6	128.2	127.9	127.5	127.1	126.8	126.4	126.0
112	130.3	129.9	129.6	129.2	128.9	128.5	128.1	127.8	127.4	127.0
113	131.2	130.8	130.5	130.1	129.8	129.4	129.0	128.7	128.3	127.9
114	132.2	131.8	131.5	131.1	130.8	130.4	130.0	129.7	129.3	128.9
115	133.2	132.8	132.5	132.1	131.8	131.4	131.0	130.7	130.3	129.9
116	134.1	133.7	133.4	133.0	132.7	132.3	132.0	131.6	131.3	130.9
117	135.1	134.7	134.4	134.0	133.7	133.3	132.9	132.6	132.2	131.8
118	136.0	135.6	135.3	134.9	134.6	134.2	133.9	133.5	133.2	132.8
119	137.0	136.6	136.3	135.9	135.6	135.2	134.9	134.5	134.2	133.8
120	137.9	137.5	137.2	136.8	136.5	136.1	135.8	135.4	135.1	134.7

TRUE PER CENT.

Ind. 121 to 191.

Temp. 11° to 20°.

Indication.	TEMPERATURES.									
	11°	12°	13°	14°	15°	16°	17°	18°	19°	20°
121	138.9	138.5	138.2	137.8	137.5	137.1	136.8	136.4	136.1	135.7
122	139.8	139.5	139.1	138.8	138.5	138.1	137.8	137.4	137.1	136.7
123	140.8	140.4	140.1	139.7	139.4	139.0	138.7	138.3	138.0	137.6
124	141.7	141.4	141.0	140.7	140.4	140.0	139.7	139.3	139.0	138.6
125	142.7	142.3	142.0	141.6	141.3	141.0	140.6	140.3	139.9	139.6
126	143.6	143.3	142.9	142.6	142.3	141.9	141.6	141.2	140.9	140.5
127	144.5	144.2	143.8	143.5	143.2	142.8	142.5	142.1	141.8	141.4
128	145.4	145.1	144.7	144.4	144.1	143.8	143.4	143.1	142.7	142.4
129	146.4	146.1	145.7	145.4	145.1	144.7	144.4	144.0	143.7	143.3
130	147.3	147.0	146.6	146.3	146.0	145.6	145.3	144.9	144.6	144.2
131	148.2	147.9	147.5	147.2	146.9	146.6	146.2	145.9	145.5	145.2
132	149.1	148.8	148.5	148.2	147.9	147.5	147.2	146.8	146.5	146.1
133	150.1	149.8	149.4	149.1	148.8	148.5	148.1	147.8	147.4	147.1
134	151.0	150.7	150.3	150.0	149.7	149.4	149.0	148.7	148.3	148.0
135	151.9	151.6	151.3	151.0	150.7	150.4	150.0	149.7	149.3	149.0
136	152.8	152.5	152.2	151.9	151.6	151.3	150.9	150.6	150.2	149.9
137	153.8	153.5	153.2	152.9	152.6	152.3	151.9	151.6	151.2	150.9
138	154.7	154.4	154.1	153.8	153.5	153.2	152.8	152.5	152.1	151.8
139	155.6	155.3	155.0	154.7	154.4	154.1	153.7	153.4	153.0	152.7
140	156.6	156.3	156.0	155.7	155.4	155.1	154.7	154.4	154.0	153.7
141	157.5	157.2	156.9	156.6	156.3	156.0	155.6	155.3	154.9	154.6
142	158.4	158.1	157.8	157.5	157.2	156.9	156.6	156.2	155.9	155.6
143	159.4	159.1	158.8	158.5	158.2	157.9	157.5	157.2	156.8	156.5
144	160.3	160.0	159.8	159.5	159.2	158.9	158.5	158.2	157.8	157.5
145	161.3	161.0	160.7	160.4	160.1	159.8	159.4	159.1	158.7	158.4
146	162.2	161.9	161.6	161.3	161.0	160.7	160.4	160.0	159.7	159.4
147	163.1	162.8	162.6	162.3	162.0	161.7	161.3	161.0	160.6	160.3
148	164.0	163.7	163.5	163.2	162.9	162.6	162.3	161.9	161.6	161.3
149	165.0	164.7	164.5	164.2	163.9	163.6	163.2	162.9	162.5	162.2
150	165.9	165.6	165.4	165.1	164.8	164.5	164.2	163.8	163.5	163.2
151	166.8	166.5	166.3	166.0	165.7	165.4	165.1	164.7	164.4	164.1
152	167.7	167.4	167.2	166.9	166.6	166.3	166.0	165.7	165.4	165.1
153	168.6	168.4	168.1	167.9	167.6	167.3	167.0	166.6	166.3	166.0
154	169.5	169.3	169.0	168.8	168.5	168.2	167.9	167.5	167.2	166.9
155	170.4	170.2	169.9	169.7	169.4	169.1	168.8	168.5	168.2	167.9
156	171.3	171.1	170.8	170.6	170.3	170.0	169.7	169.4	169.1	168.8
157	172.3	172.1	171.8	171.6	171.3	171.0	170.7	170.4	170.1	169.8
158	173.2	173.0	172.7	172.5	172.2	171.9	171.6	171.3	171.0	170.7
159	174.1	173.9	173.6	173.4	173.1	172.8	172.5	172.2	171.9	171.6
160	175.0	174.8	174.5	174.3	174.0	173.7	173.4	173.2	172.9	172.6
161	175.9	175.7	175.4	175.2	174.9	174.6	174.3	174.1	173.8	173.5
162	176.8	176.6	176.3	176.1	175.8	175.5	175.2	175.0	174.7	174.4
163	177.7	177.5	177.2	177.0	176.7	176.4	176.1	175.9	175.6	175.3
164	178.6	178.4	178.1	177.9	177.6	177.3	177.0	176.8	176.5	176.2
165	179.4	179.2	178.9	178.7	178.4	178.1	177.9	177.6	177.4	177.1
166	180.3	180.1	179.8	179.6	179.3	179.0	178.8	178.5	178.3	178.0
167	181.2	181.0	180.7	180.5	180.2	179.9	179.7	179.4	179.2	178.9
168	182.1	181.9	181.6	181.4	181.1	180.8	180.5	180.3	180.0	179.8
169	182.9	182.7	182.4	182.2	181.9	181.7	181.4	181.2	180.9	180.7
170	183.8	183.6	183.3	183.1	182.8	182.5	182.3	182.0	181.8	181.5
171	184.7	184.5	184.2	184.0	183.7	183.4	183.2	182.9	182.7	182.4
172	185.6	185.3	185.1	184.8	184.6	184.3	184.1	183.8	183.6	183.3
173	186.4	186.2	185.9	185.7	185.4	185.2	184.9	184.7	184.4	184.2
174	187.3	187.0	186.8	186.5	186.3	186.1	185.8	185.6	185.3	185.1
175	188.2	187.9	187.7	187.4	187.2	187.0	186.7	186.5	186.2	186.0
176	189.1	188.8	188.6	188.3	188.1	187.8	187.6	187.3	187.1	186.8
177	189.9	189.7	189.4	189.2	188.9	188.7	188.4	188.2	187.9	187.7
178	190.8	190.6	190.3	190.1	189.8	189.6	189.3	189.1	188.8	188.6
179	191.7	191.4	191.2	190.9	190.7	190.5	190.2	190.0	189.7	189.5
180	192.6	192.3	192.1	191.8	191.6	191.4	191.1	190.9	190.6	190.4
181	193.3	193.1	192.8	192.6	192.4	192.2	192.0	191.7	191.5	191.3
182	194.1	193.9	193.6	193.4	193.2	193.0	192.8	192.5	192.3	192.1
183	194.9	194.7	194.4	194.2	194.0	193.8	193.6	193.3	193.1	192.9
184	195.7	195.5	195.2	195.0	194.8	194.6	194.4	194.1	193.9	193.7
185	196.4	196.2	196.0	195.8	195.6	195.4	195.2	194.9	194.7	194.5
186	197.2	197.0	196.8	196.6	196.4	196.2	196.0	195.8	195.6	195.4
187	198.0	197.8	197.6	197.4	197.2	197.0	196.8	196.6	196.4	196.2
188	198.7	198.5	198.3	198.1	197.9	197.7	197.5	197.4	197.2	197.0
189	199.5	199.3	199.1	198.9	198.7	198.5	198.3	198.2	198.0	197.8
190	.....	.....	199.9	199.7	199.5	199.3	199.1	199.0	198.8	198.6
191	.....	.....	.....	.....	.....	.....	199.9	199.8	199.7	199.5

TRUE PER CENT.

Ind. 51 to 120.

Temp 21° to 30°.

Indication.	TEMPERATURES.									
	21°	22°	23°	24°	25°	26°	27°	28°	29°	30°
51	69.5	69.0	68.4	67.9	67.4	66.9	66.3	65.8	65.2	64.7
52	70.7	70.2	69.6	69.1	68.6	68.0	67.5	66.9	66.4	65.8
53	71.8	71.3	70.7	70.2	69.7	69.1	68.6	68.0	67.5	66.9
54	72.9	72.4	71.9	71.4	70.9	70.3	69.7	69.2	68.6	68.0
55	74.0	73.5	73.0	72.5	72.0	71.4	70.8	70.3	69.7	69.1
56	75.1	74.6	74.1	73.6	73.1	72.5	71.9	71.3	70.7	70.1
57	76.1	75.6	75.1	74.6	74.1	73.5	72.9	72.4	71.8	71.2
58	77.1	76.6	76.1	75.6	75.1	74.5	73.9	73.4	72.8	72.2
59	78.1	77.6	77.1	76.6	76.1	75.5	75.0	74.4	73.9	73.3
60	79.0	78.5	78.1	77.6	77.1	76.6	76.0	75.5	74.9	74.4
61	79.9	79.5	79.0	78.6	78.1	77.6	77.0	76.5	75.9	75.4
62	80.9	80.4	80.0	79.5	79.1	78.6	78.0	77.5	76.9	76.4
63	81.8	81.3	80.9	80.4	80.0	79.5	78.9	78.4	77.8	77.3
64	82.7	82.2	81.8	81.3	80.9	80.4	79.8	79.3	78.7	78.2
65	83.6	83.1	82.7	82.2	81.8	81.3	80.7	80.2	79.6	79.1
66	84.4	84.0	83.5	83.1	82.7	82.2	81.7	81.1	80.6	80.1
67	85.3	84.9	84.4	84.0	83.6	83.1	82.6	82.0	81.5	81.0
68	86.2	85.8	85.3	84.9	84.5	84.0	83.5	82.9	82.4	81.9
69	87.1	86.7	86.2	85.8	85.4	84.9	84.4	83.8	83.3	82.8
70	88.0	87.6	87.1	86.7	86.3	85.8	85.3	84.8	84.3	83.8
71	88.9	88.5	88.0	87.6	87.2	86.7	86.2	85.7	85.2	84.7
72	89.8	89.4	88.9	88.5	88.1	87.6	87.1	86.6	86.1	85.6
73	90.7	90.3	89.8	89.4	89.0	88.5	88.0	87.5	87.0	86.5
74	91.6	91.2	90.7	90.3	89.9	89.4	88.9	88.5	88.0	87.5
75	92.5	92.1	91.6	91.2	90.8	90.3	89.8	89.4	88.9	88.4
76	93.4	93.0	92.5	92.1	91.7	91.3	90.8	90.3	89.9	89.4
77	94.2	93.8	93.4	93.0	92.6	92.2	91.7	91.2	90.8	90.3
78	95.2	94.8	94.4	94.0	93.6	93.2	92.7	92.2	91.8	91.3
79	96.1	95.7	95.3	94.9	94.5	94.1	93.6	93.1	92.7	92.2
80	97.0	96.6	96.2	95.8	95.4	95.0	94.5	94.0	93.6	93.1
81	97.9	97.5	97.1	96.7	96.3	95.9	95.5	95.0	94.6	94.1
82	98.8	98.4	98.0	97.6	97.2	96.8	96.4	95.9	95.5	95.0
83	99.8	99.4	98.9	98.5	98.1	97.7	97.3	96.8	96.4	95.9
84	100.7	100.3	99.8	99.4	99.0	98.6	98.2	97.7	97.3	96.8
85	101.6	101.2	100.7	100.3	99.9	99.5	99.1	98.6	98.2	97.8
86	102.5	102.1	101.7	101.3	100.9	100.5	100.1	99.6	99.2	98.7
87	103.4	103.0	102.6	102.2	101.8	101.4	101.0	100.5	100.1	99.7
88	104.3	103.9	103.5	103.1	102.7	102.3	101.9	101.5	101.1	100.7
89	105.2	104.8	104.4	104.0	103.6	103.2	102.8	102.4	102.0	101.6
90	106.1	105.7	105.3	104.9	104.5	104.1	103.7	103.3	102.9	102.5
91	107.0	106.6	106.2	105.8	105.4	105.0	104.6	104.3	103.9	103.5
92	107.9	107.5	107.1	106.7	106.3	105.9	105.5	105.2	104.8	104.4
93	108.8	108.4	108.1	107.7	107.3	106.9	106.5	106.2	105.8	105.4
94	109.8	109.4	109.0	108.6	108.2	107.8	107.4	107.1	106.7	106.3
95	110.7	110.3	109.9	109.5	109.1	108.7	108.3	108.0	107.6	107.2
96	111.6	111.2	110.9	110.5	110.1	109.7	109.3	108.9	108.5	108.1
97	112.5	112.1	111.8	111.4	111.0	110.6	110.2	109.9	109.5	109.1
98	113.5	113.1	112.7	112.3	111.9	111.5	111.1	110.8	110.4	110.0
99	114.4	114.0	113.7	113.3	112.9	112.5	112.1	111.8	111.4	111.0
100	115.3	114.9	114.6	114.2	113.8	113.4	113.0	112.7	112.3	111.9
101	116.3	115.9	115.5	115.1	114.7	114.3	113.9	113.6	113.2	112.8
102	117.2	116.8	116.5	116.1	115.7	115.3	114.9	114.6	114.2	113.8
103	118.1	117.7	117.4	117.0	116.6	116.2	115.8	115.5	115.1	114.7
104	119.0	118.6	118.3	117.9	117.5	117.1	116.8	116.4	116.1	115.7
105	119.9	119.6	119.2	118.9	118.5	118.1	117.8	117.4	117.1	116.7
106	120.9	120.5	120.2	119.8	119.4	119.0	118.7	118.3	118.0	117.6
107	121.8	121.5	121.1	120.8	120.4	120.0	119.7	119.3	119.0	118.6
108	122.7	122.4	122.0	121.7	121.3	120.9	120.6	120.2	119.9	119.5
109	123.7	123.4	123.0	122.7	122.3	121.9	121.6	121.2	120.9	120.5
110	124.6	124.3	123.9	123.6	123.2	122.8	122.5	122.1	121.8	121.4
111	125.6	125.3	124.9	124.6	124.2	123.8	123.5	123.1	122.8	122.4
112	126.6	126.3	125.9	125.6	125.2	124.8	124.5	124.1	123.8	123.4
113	127.5	127.2	126.8	126.5	126.1	125.8	125.4	125.1	124.7	124.4
114	128.5	128.2	127.8	127.5	127.1	126.7	126.4	126.0	125.7	125.3
115	129.5	129.2	128.8	128.5	128.1	127.7	127.4	127.0	126.7	126.3
116	130.5	130.2	129.8	129.5	129.1	128.7	128.4	128.0	127.7	127.3
117	131.4	131.1	130.7	130.4	130.0	129.6	129.3	128.9	128.6	128.2
118	132.4	132.1	131.7	131.4	131.0	130.6	130.3	129.9	129.6	129.2
119	133.4	133.1	132.7	132.4	132.0	131.6	131.3	130.9	130.6	130.2
120	134.3	134.0	133.6	133.3	132.9	132.6	132.2	131.9	131.5	131.2

TRUE PER CENT.

Ind. 121 to 193.

Temp. 21° to 30°.

Indication.	TEMPERATURES.									
	21°	22°	23°	24°	25°	26°	27°	28°	29°	30°
121	135.3	135.0	134.6	134.3	133.9	133.5	133.2	132.8	132.5	132.1
122	136.3	135.9	135.6	135.2	134.8	134.5	134.1	133.8	133.4	133.1
123	137.2	136.9	136.5	136.2	135.8	135.5	135.1	134.8	134.4	134.1
124	138.2	137.9	137.5	137.2	136.8	136.5	136.1	135.8	135.4	135.1
125	139.2	138.8	138.5	138.1	137.7	137.4	137.0	136.7	136.3	136.0
126	140.1	139.8	139.4	139.1	138.7	138.3	138.0	137.6	137.3	136.9
127	141.0	140.7	140.3	140.0	139.6	139.2	138.9	138.6	138.2	137.9
128	142.0	141.7	141.3	141.0	140.6	140.2	139.9	139.5	139.2	138.8
129	142.9	142.6	142.2	141.9	141.5	141.2	140.8	140.5	140.1	139.8
130	143.9	143.5	143.2	142.8	142.5	142.1	141.8	141.4	141.1	140.7
131	144.9	144.5	144.2	143.8	143.5	143.1	142.8	142.4	142.1	141.7
132	145.8	145.4	145.1	144.7	144.4	144.1	143.7	143.3	143.0	142.6
133	146.8	146.4	146.1	145.7	145.4	145.1	144.7	144.3	144.0	143.6
134	147.7	147.3	147.0	146.6	146.3	146.0	145.6	145.3	144.9	144.6
135	148.7	148.3	148.0	147.6	147.3	146.9	146.6	146.2	145.9	145.5
136	149.6	149.2	148.9	148.5	148.2	147.9	147.5	147.2	146.8	146.5
137	150.6	150.2	149.9	149.5	149.2	148.8	148.5	148.1	147.8	147.4
138	151.5	151.1	150.8	150.4	150.1	149.8	149.4	149.1	148.7	148.4
139	152.4	152.1	151.7	151.4	151.1	150.7	150.4	150.0	149.7	149.3
140	153.4	153.0	152.7	152.3	152.0	151.7	151.3	151.0	150.6	150.3
141	154.3	154.0	153.6	153.3	153.0	152.7	152.3	152.0	151.6	151.3
142	155.3	155.0	154.6	154.3	154.0	153.7	153.3	153.0	152.6	152.3
143	156.2	155.9	155.5	155.2	154.9	154.6	154.2	153.9	153.5	153.2
144	157.2	156.9	156.5	156.2	155.9	155.6	155.2	154.9	154.5	154.2
145	158.1	157.8	157.5	157.2	156.9	156.6	156.2	155.8	155.5	155.1
146	159.1	158.8	158.4	158.1	157.8	157.5	157.1	156.8	156.4	156.1
147	160.0	159.7	159.4	159.1	158.8	158.5	158.1	157.8	157.4	157.1
148	161.0	160.7	160.3	160.0	159.7	159.4	159.0	158.7	158.3	158.0
149	161.9	161.6	161.3	161.0	160.7	160.4	160.0	159.7	159.3	159.0
150	162.8	162.5	162.2	161.9	161.6	161.3	160.9	160.6	160.2	159.9
151	163.8	163.5	163.1	162.8	162.5	162.2	161.9	161.5	161.2	160.9
152	164.8	164.5	164.1	163.8	163.5	163.2	162.9	162.5	162.2	161.9
153	165.7	165.4	165.0	164.7	164.4	164.1	163.8	163.4	163.1	162.8
154	166.6	166.3	166.0	165.7	165.4	165.1	164.8	164.4	164.1	163.8
155	167.6	167.3	166.9	166.6	166.3	166.0	165.7	165.4	165.1	164.8
156	168.5	168.2	167.9	167.6	167.3	167.0	166.7	166.3	166.0	165.7
157	169.5	169.2	168.8	168.5	168.2	167.9	167.6	167.3	167.0	166.7
158	170.4	170.1	169.8	169.5	169.2	168.9	168.6	168.3	168.0	167.7
159	171.3	171.0	170.7	170.4	170.1	169.8	169.5	169.2	168.9	168.6
160	172.3	172.0	171.7	171.4	171.1	170.8	170.5	170.1	169.8	169.5
161	173.2	172.9	172.6	172.3	172.0	171.7	171.4	171.0	170.7	170.4
162	174.1	173.8	173.5	173.2	172.9	172.6	172.3	172.0	171.7	171.4
163	175.0	174.7	174.4	174.1	173.8	173.5	173.2	172.9	172.6	172.3
164	175.9	175.6	175.3	175.0	174.7	174.4	174.1	173.8	173.5	173.2
165	176.8	176.5	176.3	176.0	175.7	175.4	175.1	174.7	174.4	174.1
166	177.7	177.4	177.2	176.9	176.6	176.3	176.0	175.7	175.4	175.1
167	178.6	178.3	178.1	177.8	177.5	177.2	176.9	176.6	176.3	176.0
168	179.5	179.2	179.0	178.7	178.4	178.1	177.8	177.5	177.2	176.9
169	180.4	180.1	179.9	179.6	179.3	179.0	178.7	178.5	178.2	177.9
170	181.2	181.0	180.7	180.5	180.2	179.9	179.6	179.4	179.1	178.8
171	182.1	181.9	181.6	181.4	181.1	180.8	180.5	180.3	180.0	179.7
172	183.0	182.8	182.5	182.3	182.0	181.7	181.4	181.2	180.9	180.6
173	183.9	183.7	183.4	183.2	182.9	182.6	182.3	182.1	181.8	181.5
174	184.8	184.6	184.3	184.1	183.8	183.5	183.2	183.0	182.7	182.4
175	185.7	185.5	185.2	185.0	184.7	184.4	184.1	183.9	183.6	183.3
176	186.6	186.3	186.1	185.8	185.6	185.3	185.0	184.8	184.5	184.2
177	187.5	187.2	187.0	186.7	186.5	186.2	186.0	185.7	185.5	185.2
178	188.4	188.1	187.9	187.6	187.4	187.1	186.9	186.6	186.4	186.1
179	189.3	189.0	188.8	188.5	188.3	188.0	187.8	187.5	187.3	187.0
180	190.2	189.9	189.7	189.4	189.2	188.9	188.6	188.4	188.1	187.8
181	191.1	190.8	190.6	190.3	190.1	189.8	189.5	189.3	189.0	188.7
182	191.9	191.6	191.4	191.1	190.9	190.6	190.4	190.1	189.9	189.6
183	192.7	192.5	192.2	192.0	191.8	191.5	191.3	191.0	190.8	190.5
184	193.5	193.3	193.0	192.8	192.6	192.3	192.1	191.8	191.6	191.3
185	194.3	194.1	193.9	193.7	193.5	193.2	193.0	192.7	192.5	192.2
186	195.2	195.0	194.7	194.5	194.3	194.0	193.8	193.5	193.3	193.0
187	196.0	195.8	195.6	195.4	195.2	194.9	194.7	194.4	194.2	193.9
188	196.8	196.6	196.4	196.2	196.0	195.8	195.5	195.3	195.0	194.8
189	197.6	197.4	197.3	197.1	196.9	196.6	196.4	196.1	195.9	195.6
190	198.4	198.2	198.1	197.9	197.7	197.6	197.3	197.1	196.8	196.5
191	199.3	199.1	199.0	198.8	198.6	198.4	198.1	197.9	197.6	197.4
192	.....	199.9	199.7	199.6	199.4	199.2	199.0	198.7	198.5	198.3
193	.....	.....	.....	.....	.....	.....	199.9	199.6	199.4	199.2

TRUE PER CENT.

Ind. 1 to 65.

Temp. 31° to 40°.

Indication.	TEMPERATURES.									
	31°	32°	33°	34°	35°	36°	37°	38°	39°	40°
1	1.7	1.7	1.8	1.8	1.9	1.9	1.9	2.0	2.0	2.0
2	2.7	2.7	2.8	2.8	2.9	2.9	2.9	3.0	3.0	3.0
3	3.7	3.7	3.8	3.8	3.9	3.9	3.9	4.0	4.0	4.0
4	4.7	4.7	4.8	4.8	4.9	4.9	4.9	5.0	5.0	5.0
5	5.7	5.7	5.8	5.8	5.9	5.9	5.9	6.0	6.0	6.0
6	6.7	6.8	6.8	6.9	6.9	6.9	6.9	7.0	7.0	7.0
7	7.7	7.8	7.8	7.9	7.9	7.9	7.9	8.0	8.0	8.0
8	8.8	8.8	8.9	8.9	9.0	9.0	9.0	9.0	9.0	9.0
9	9.8	9.8	9.9	9.9	10.0	10.0	10.0	10.1	10.1	10.1
10	10.9	10.9	11.0	11.0	11.1	11.1	11.1	11.2	11.2	11.2
11	12.0	12.0	12.1	12.1	12.2	12.2	12.2	12.3	12.3	12.3
12	13.1	13.2	13.2	13.3	13.3	13.3	13.3	13.3	13.3	13.3
13	14.2	14.3	14.3	14.4	14.4	14.4	14.4	14.4	14.4	14.4
14	15.3	15.4	15.4	15.5	15.5	15.5	15.5	15.5	15.5	15.5
15	16.4	16.5	16.5	16.6	16.6	16.6	16.6	16.6	16.6	16.6
16	17.5	17.6	17.6	17.7	17.7	17.7	17.7	17.7	17.7	17.7
17	18.6	18.7	18.7	18.8	18.8	18.8	18.8	18.7	18.7	18.7
18	19.7	19.8	19.8	19.9	19.9	19.9	19.9	19.8	19.8	19.8
19	21.0	21.0	21.1	21.1	21.1	21.1	21.1	21.0	21.0	21.0
20	22.3	22.3	22.4	22.4	22.4	22.4	22.4	22.3	22.3	22.3
21	23.6	23.6	23.6	23.6	23.6	23.6	23.5	23.5	23.4	23.4
22	24.8	24.8	24.8	24.8	24.8	24.7	24.7	24.6	24.6	24.5
23	26.0	26.0	25.9	25.9	25.9	25.8	25.8	25.7	25.7	25.6
24	27.2	27.2	27.1	27.1	27.1	27.0	27.0	26.9	26.9	26.8
25	28.4	28.3	28.3	28.2	28.2	28.1	28.1	28.0	28.0	27.9
26	29.7	29.7	29.6	29.6	29.5	29.4	29.3	29.3	29.2	29.1
27	31.2	31.1	31.1	31.0	30.9	30.8	30.7	30.6	30.5	30.4
28	32.6	32.5	32.4	32.3	32.2	32.1	32.0	31.8	31.7	31.6
29	34.0	33.9	33.8	33.7	33.6	33.5	33.3	33.2	33.0	32.9
30	35.4	35.2	35.1	34.9	34.8	34.7	34.5	34.4	34.2	34.1
31	36.7	36.6	36.4	36.3	36.1	35.9	35.8	35.6	35.5	35.3
32	38.3	38.1	38.0	37.8	37.6	37.4	37.2	36.9	36.7	36.5
33	39.9	39.7	39.4	39.2	39.0	38.8	38.5	38.3	38.0	37.8
34	41.4	41.2	40.9	40.7	40.4	40.1	39.9	39.6	39.4	39.1
35	42.9	42.7	42.4	42.2	41.9	41.6	41.3	41.1	40.8	40.5
36	44.4	44.1	43.9	43.6	43.3	43.0	42.7	42.4	42.1	41.8
37	45.8	45.5	45.2	44.9	44.6	44.3	44.0	43.7	43.4	43.1
38	47.1	46.8	46.5	46.2	45.9	45.6	45.3	45.0	44.7	44.4
39	48.5	48.2	47.8	47.5	47.2	46.9	46.6	46.2	45.9	45.6
40	49.9	49.5	49.2	48.8	48.5	48.2	47.8	47.5	47.1	46.8
41	51.2	50.8	50.5	50.1	49.7	49.4	49.0	48.7	48.3	48.0
42	52.6	52.2	51.8	51.4	51.0	50.6	50.2	49.9	49.5	49.1
43	54.0	53.6	53.1	52.7	52.3	51.9	51.5	51.1	50.7	50.3
44	55.4	54.9	54.5	54.0	53.6	53.2	52.8	52.3	51.9	51.5
45	56.7	56.3	55.8	55.4	54.9	54.5	54.1	53.6	53.2	52.8
46	58.1	57.6	57.2	56.7	56.2	55.8	55.3	54.9	54.4	54.0
47	59.4	58.9	58.4	57.9	57.4	57.0	56.5	56.1	55.6	55.2
48	60.7	60.2	59.7	59.2	58.7	58.2	57.8	57.3	56.9	56.4
49	61.9	61.4	60.9	60.4	59.9	59.4	58.9	58.5	58.0	57.5
50	63.1	62.6	62.2	61.7	61.3	60.8	60.2	59.7	59.1	58.6
51	64.2	63.8	63.3	62.9	62.4	61.9	61.4	60.8	60.3	59.8
52	65.3	64.9	64.4	64.0	63.5	63.0	62.5	61.9	61.4	60.9
53	66.4	65.9	65.5	65.0	64.5	64.0	63.5	63.1	62.6	62.1
54	67.5	67.0	66.5	66.0	65.5	65.0	64.5	64.1	63.6	63.1
55	68.6	68.1	67.6	67.1	66.6	66.1	65.6	65.2	64.7	64.2
56	69.6	69.1	68.6	68.1	67.6	67.1	66.6	66.2	65.7	65.2
57	70.6	70.1	69.7	69.2	68.7	68.2	67.7	67.3	66.8	66.3
58	71.7	71.2	70.7	70.2	69.7	69.2	68.7	68.3	67.8	67.3
59	72.8	72.3	71.7	71.2	70.7	70.2	69.7	69.3	68.8	68.3
60	73.9	73.4	72.8	72.3	71.8	71.3	70.8	70.3	69.8	69.3
61	74.9	74.4	73.8	73.3	72.8	72.3	71.8	71.4	70.9	70.4
62	75.9	75.4	74.8	74.3	73.8	73.3	72.8	72.4	71.9	71.4
63	76.8	76.3	75.9	75.4	74.9	74.4	73.9	73.4	72.9	72.4
64	77.7	77.3	76.8	76.4	75.9	75.4	74.9	74.4	73.9	73.4
65	78.7	78.2	77.8	77.3	76.9	76.4	75.9	75.4	74.9	74.4

TRUE PER CENT.

Ind. 66 to 130.

Temp. 31° to 40°.

Indication.	TEMPERATURES.									
	31°	32°	33°	34°	35°	36°	37°	38°	39°	40°
66	79.6	79.2	78.7	78.3	77.8	77.3	76.9	76.4	76.0	75.5
67	80.5	80.1	79.6	79.2	78.7	78.3	77.8	77.4	76.9	76.5
68	81.5	81.0	80.6	80.1	79.7	79.2	78.8	78.3	77.9	77.4
69	82.4	81.9	81.5	81.0	80.6	80.1	79.7	79.2	78.8	78.3
70	83.3	82.9	82.4	82.0	81.5	81.1	80.6	80.2	79.7	79.3
71	84.3	83.8	83.4	82.9	82.5	82.1	81.6	81.2	80.7	80.3
72	85.2	84.7	84.3	83.8	83.4	83.0	82.5	82.1	81.6	81.2
73	86.1	85.7	85.2	84.8	84.4	83.9	83.5	83.0	82.6	82.1
74	87.1	86.6	86.2	85.7	85.3	84.9	84.4	84.0	83.5	83.1
75	88.0	87.6	87.1	86.7	86.3	85.9	85.4	85.0	84.5	84.1
76	89.0	88.5	88.1	87.6	87.2	86.8	86.3	85.9	85.4	85.0
77	89.9	89.4	89.0	88.5	88.1	87.7	87.2	86.8	86.3	85.9
78	90.9	90.4	90.0	89.5	89.1	88.7	88.2	87.8	87.3	86.9
79	91.8	91.3	90.9	90.4	90.0	89.6	89.2	88.7	88.3	87.9
80	92.7	92.3	91.8	91.4	91.0	90.6	90.1	89.7	89.2	88.8
81	93.7	93.2	92.8	92.3	91.9	91.5	91.0	90.6	90.1	89.7
82	94.6	94.2	93.7	93.3	92.9	92.5	92.0	91.6	91.1	90.7
83	95.5	95.1	94.7	94.3	93.9	93.5	93.0	92.6	92.1	91.7
84	96.4	96.0	95.6	95.2	94.8	94.4	94.0	93.5	93.1	92.7
85	97.4	97.0	96.5	96.1	95.7	95.3	94.9	94.5	94.1	93.7
86	98.3	97.9	97.5	97.1	96.7	96.3	95.9	95.4	95.0	94.6
87	99.3	98.9	98.4	98.0	97.6	97.2	96.8	96.4	96.0	95.6
88	100.3	99.9	99.4	99.0	98.6	98.2	97.8	97.3	96.9	96.5
89	101.2	100.8	100.3	99.9	99.5	99.1	98.7	98.3	97.9	97.5
90	102.1	101.7	101.3	100.9	100.5	100.1	99.7	99.2	98.8	98.4
91	103.1	102.7	102.2	101.8	101.4	101.0	100.6	100.2	99.8	99.4
92	104.0	103.6	103.2	102.8	102.4	102.0	101.6	101.1	100.7	100.3
93	105.0	104.6	104.1	103.7	103.3	102.9	102.5	102.1	101.7	101.3
94	105.9	105.5	105.1	104.7	104.3	103.9	103.5	103.1	102.7	102.3
95	106.8	106.4	106.1	105.7	105.3	104.9	104.5	104.0	103.6	103.2
96	107.7	107.3	107.0	106.6	106.2	105.8	105.4	105.0	104.6	104.2
97	108.7	108.3	108.0	107.6	107.2	106.8	106.4	106.0	105.6	105.2
98	109.6	109.2	108.9	108.5	108.1	107.7	107.3	107.0	106.6	106.2
99	110.6	110.2	109.8	109.4	109.0	108.6	108.2	107.9	107.5	107.1
100	111.5	111.1	110.8	110.4	110.0	109.6	109.2	108.9	108.5	108.1
101	112.4	112.0	111.7	111.3	110.9	110.5	110.1	109.8	109.4	109.0
102	113.4	113.0	112.7	112.3	111.9	111.5	111.1	110.8	110.4	110.0
103	114.3	114.0	113.6	113.3	112.9	112.5	112.1	111.7	111.3	110.9
104	115.3	114.9	114.6	114.2	113.8	113.4	113.0	112.7	112.3	111.9
105	116.3	115.9	115.6	115.2	114.8	114.4	114.0	113.7	113.3	112.9
106	117.2	116.8	116.5	116.1	115.7	115.3	114.9	114.6	114.2	113.8
107	118.2	117.8	117.5	117.1	116.7	116.3	115.9	115.6	115.2	114.8
108	119.1	118.8	118.4	118.1	117.7	117.3	116.9	116.6	116.2	115.8
109	120.1	119.8	119.4	119.1	118.7	118.3	117.9	117.6	117.2	116.8
110	121.0	120.7	120.3	120.0	119.6	119.2	118.9	118.5	118.2	117.8
111	122.0	121.7	121.3	121.0	120.6	120.2	119.8	119.5	119.1	118.7
112	123.0	122.6	122.3	121.9	121.5	121.1	120.8	120.4	120.1	119.7
113	124.0	123.6	123.3	122.9	122.5	122.1	121.8	121.4	121.1	120.7
114	124.9	124.6	124.2	123.9	123.5	123.1	122.7	122.4	122.0	121.6
115	125.9	125.6	125.2	124.9	124.5	124.1	123.7	123.4	123.0	122.6
116	126.9	126.5	126.2	125.8	125.4	125.0	124.7	124.3	124.0	123.6
117	127.8	127.5	127.1	126.8	126.4	126.0	125.7	125.3	125.0	124.6
118	128.8	128.5	128.1	127.8	127.4	127.0	126.7	126.3	126.0	125.6
119	129.8	129.4	129.1	128.7	128.3	127.9	127.6	127.2	126.9	126.5
120	130.8	130.4	130.1	129.7	129.3	128.9	128.6	128.2	127.9	127.5
121	131.7	131.4	131.0	130.7	130.3	129.9	129.6	129.2	128.9	128.5
122	132.7	132.4	132.0	131.7	131.3	130.9	130.6	130.2	129.9	129.5
123	133.7	133.4	133.0	132.7	132.3	131.9	131.6	131.2	130.9	130.5
124	134.7	134.4	134.0	133.7	133.3	132.9	132.6	132.2	131.9	131.5
125	135.7	135.3	135.0	134.6	134.3	133.9	133.6	133.2	132.9	132.5
126	136.6	136.2	135.9	135.5	135.2	134.9	134.5	134.2	133.8	133.5
127	137.5	137.2	136.8	136.5	136.1	135.8	135.4	135.1	134.7	134.4
128	138.5	138.1	137.8	137.4	137.1	136.8	136.4	136.1	135.7	135.4
129	139.5	139.1	138.8	138.4	138.1	137.7	137.4	137.0	136.7	136.3
130	140.4	140.0	139.7	139.3	139.0	138.7	138.3	138.0	137.6	137.3

TRUE PER CENT.

Ind. 131 to 195.

Temp. 31° to 40°.

Indication.	TEMPERATURES.									
	31°	32°	33°	34°	35°	36°	37°	38°	39°	40°
131	141.4	141.0	140.7	140.3	140.0	139.6	139.3	138.9	138.6	138.2
132	142.3	141.9	141.6	141.2	140.9	140.6	140.2	139.9	139.5	139.2
133	143.3	142.9	142.6	142.2	141.9	141.6	141.2	140.9	140.5	140.2
134	144.2	143.9	143.5	143.2	142.8	142.5	142.1	141.8	141.4	141.1
135	145.2	144.8	144.5	144.1	143.8	143.5	143.1	142.8	142.4	142.1
136	146.2	145.8	145.5	145.1	144.8	144.5	144.1	143.8	143.4	143.1
137	147.1	146.8	146.4	146.1	145.8	145.4	145.1	144.7	144.4	144.0
138	148.1	147.7	147.4	147.0	146.7	146.4	146.0	145.7	145.3	145.0
139	149.0	148.7	148.3	148.0	147.7	147.4	147.0	146.7	146.3	146.0
140	150.0	149.7	149.3	149.0	148.7	148.4	148.0	147.7	147.3	147.0
141	151.0	150.6	150.3	149.9	149.6	149.3	149.0	148.6	148.3	148.0
142	152.0	151.6	151.3	150.9	150.6	150.3	149.9	149.6	149.2	148.9
143	152.9	152.5	152.2	151.8	151.5	151.2	150.9	150.5	150.2	149.9
144	153.9	153.5	153.2	152.8	152.5	152.2	151.9	151.5	151.2	150.9
145	154.8	154.5	154.1	153.8	153.5	153.2	152.9	152.5	152.2	151.9
146	155.8	155.5	155.1	154.8	154.5	154.2	153.8	153.5	153.1	152.8
147	156.8	156.4	156.1	155.7	155.4	155.1	154.8	154.4	154.1	153.8
148	157.7	157.4	157.0	156.7	156.4	156.1	155.8	155.4	155.1	154.8
149	158.7	158.4	158.0	157.7	157.4	157.1	156.7	156.4	156.0	155.7
150	159.6	159.3	158.9	158.6	158.3	158.0	157.7	157.3	157.0	156.7
151	160.6	160.3	159.9	159.6	159.3	159.0	158.7	158.3	158.0	157.7
152	161.6	161.3	160.9	160.6	160.3	160.0	159.7	159.3	159.0	158.7
153	162.5	162.2	161.8	161.5	161.2	160.9	160.6	160.2	159.9	159.6
154	163.5	163.2	162.8	162.5	162.2	161.9	161.6	161.2	160.9	160.6
155	164.5	164.2	163.8	163.5	163.2	162.9	162.6	162.2	161.9	161.6
156	165.4	165.1	164.7	164.4	164.1	163.8	163.5	163.2	162.9	162.6
157	166.4	166.1	165.7	165.4	165.1	164.8	164.5	164.1	163.8	163.5
158	167.4	167.1	166.7	166.4	166.1	165.8	165.5	165.1	164.8	164.5
159	168.3	168.0	167.6	167.3	167.0	166.7	166.4	166.1	165.8	165.5
160	169.2	168.9	168.6	168.3	168.0	167.7	167.4	167.0	166.7	166.4
161	170.1	169.8	169.5	169.2	168.9	168.6	168.3	168.0	167.7	167.4
162	171.1	170.8	170.5	170.2	169.9	169.6	169.3	169.0	168.7	168.4
163	172.0	171.7	171.4	171.1	170.8	170.5	170.2	169.9	169.6	169.3
164	172.9	172.6	172.4	172.1	171.8	171.5	171.2	170.9	170.6	170.3
165	173.8	173.5	173.3	173.0	172.7	172.4	172.1	171.9	171.6	171.3
166	174.8	174.5	174.3	174.0	173.7	173.4	173.1	172.8	172.5	172.2
167	175.7	175.4	175.2	174.9	174.6	174.3	174.0	173.8	173.5	173.2
168	176.6	176.3	176.1	175.8	175.5	175.2	174.9	174.7	174.4	174.1
169	177.6	177.3	177.1	176.8	176.5	176.2	175.9	175.6	175.3	175.0
170	178.5	178.2	178.0	177.7	177.4	177.1	176.8	176.6	176.3	176.0
171	179.4	179.1	178.9	178.6	178.3	178.0	177.7	177.5	177.2	176.9
172	180.3	180.0	179.8	179.5	179.2	178.9	178.7	178.4	178.2	177.9
173	181.2	181.0	180.7	180.5	180.2	179.9	179.6	179.4	179.1	178.8
174	182.1	181.9	181.6	181.4	181.1	180.8	180.5	180.3	180.0	179.7
175	183.0	182.8	182.5	182.3	182.0	181.7	181.5	181.2	181.0	180.7
176	183.9	183.7	183.4	183.2	182.9	182.6	182.4	182.1	181.9	181.6
177	184.9	184.7	184.4	184.2	183.9	183.6	183.3	183.1	182.8	182.5
178	185.8	185.6	185.3	185.1	184.8	184.5	184.3	184.0	183.8	183.5
179	186.7	186.5	186.2	186.0	185.7	185.4	185.2	184.9	184.7	184.4
180	187.6	187.3	187.1	186.8	186.6	186.4	186.1	185.9	185.6	185.4
181	188.5	188.2	188.0	187.7	187.5	187.3	187.1	186.8	186.6	186.4
182	189.4	189.1	188.9	188.6	188.4	188.2	188.0	187.7	187.5	187.3
183	190.3	190.0	189.8	189.5	189.3	189.1	188.9	188.6	188.4	188.2
184	191.1	190.9	190.6	190.4	190.2	190.0	189.7	189.5	189.2	189.0
185	192.0	191.8	191.5	191.3	191.1	190.9	190.6	190.4	190.1	189.9
186	192.8	192.6	192.3	192.1	191.9	191.7	191.5	191.2	191.0	190.8
187	193.7	193.5	193.2	193.0	192.8	192.6	192.4	192.1	191.9	191.7
188	194.6	194.4	194.1	193.9	193.7	193.5	193.3	193.1	192.9	192.7
189	195.4	195.2	195.0	194.8	194.6	194.4	194.2	194.0	193.8	193.6
190	196.3	196.1	195.9	195.7	195.5	195.3	195.1	194.9	194.7	194.5
191	197.2	197.0	196.8	186.6	196.4	196.2	196.0	195.8	195.6	195.4
192	198.1	197.9	197.8	197.6	197.4	197.2	197.0	196.7	196.5	196.3
193	199.0	198.8	198.7	198.5	198.3	198.1	197.9	197.7	197.5	197.3
194	200.0	199.8	199.6	199.4	199.2	199.0	198.8	198.6	198.4	198.2
195	-----	-----	-----	-----	-----	199.9	199.7	199.6	199.4	199.2

TRUE PER CENT.

Ind. 1 to 65.

Temp. 41° to 50°.

Indication.	TEMPERATURES.									
	41°	42°	43°	44°	45°	46°	47°	48°	49°	50°
1	2.0	2.0	1.9	1.9	1.9	1.9	1.9	1.8	1.8	1.8
2	3.0	3.0	2.9	2.9	2.9	2.9	2.9	2.8	2.8	2.8
3	4.0	4.0	4.0	4.0	4.0	4.0	3.9	3.9	3.8	3.8
4	5.0	5.0	5.0	5.0	5.0	5.0	4.9	4.9	4.8	4.8
5	6.0	6.0	6.0	6.0	6.0	6.0	5.9	5.9	5.8	5.8
6	7.0	7.0	7.0	7.0	7.0	7.0	6.9	6.9	6.8	6.8
7	8.0	8.0	8.0	8.0	8.0	8.0	7.9	7.9	7.8	7.8
8	9.0	9.0	9.0	9.0	9.0	9.0	8.9	8.9	8.8	8.8
9	10.1	10.1	10.0	10.0	10.0	10.0	9.9	9.9	9.8	9.8
10	11.2	11.2	11.1	11.1	11.1	11.1	11.0	11.0	10.9	10.9
11	12.3	12.3	12.2	12.2	12.2	12.2	12.1	12.1	12.0	12.0
12	13.3	13.3	13.3	13.3	13.3	13.2	13.2	13.1	13.1	13.0
13	14.4	14.4	14.3	14.3	14.3	14.2	14.2	14.1	14.1	14.0
14	15.5	15.5	15.4	15.4	15.4	15.3	15.3	15.2	15.2	15.1
15	16.6	16.5	16.5	16.4	16.4	16.3	16.3	16.2	16.2	16.1
16	17.7	17.6	17.6	17.5	17.5	17.4	17.3	17.3	17.2	17.1
17	18.7	18.6	18.6	18.5	18.5	18.4	18.4	18.3	18.3	18.2
18	19.7	19.7	19.6	19.6	19.5	19.4	19.4	19.3	19.3	19.2
19	20.9	20.9	20.8	20.8	20.7	20.6	20.5	20.5	20.4	20.3
20	22.2	22.1	22.1	22.0	21.9	21.8	21.7	21.6	21.5	21.4
21	23.3	23.2	23.2	23.1	23.0	22.9	22.8	22.7	22.6	22.5
22	24.4	24.3	24.3	24.2	24.1	24.0	23.9	23.7	23.6	23.5
23	25.5	25.4	25.4	25.3	25.2	25.1	25.0	24.8	24.7	24.6
24	26.7	26.6	26.5	26.4	26.3	26.2	26.1	25.9	25.8	25.7
25	27.8	27.7	27.6	27.5	27.4	27.3	27.1	27.0	26.8	26.7
26	29.0	28.9	28.7	28.6	28.5	28.4	28.2	28.1	27.9	27.8
27	30.3	30.1	30.0	29.8	29.7	29.5	29.4	29.2	29.1	28.9
28	31.4	31.3	31.1	31.0	30.8	30.6	30.5	30.3	30.2	30.0
29	32.7	32.6	32.4	32.3	32.1	31.9	31.7	31.5	31.3	31.1
30	33.9	33.7	33.6	33.4	33.2	33.0	32.8	32.6	32.4	32.2
31	35.1	34.9	34.8	34.6	34.4	34.2	34.0	33.7	33.5	33.3
32	36.3	36.1	35.9	35.7	35.5	35.3	35.1	34.8	34.6	34.4
33	37.6	37.4	37.1	36.9	36.7	36.5	36.2	36.0	35.7	35.5
34	38.9	38.6	38.4	38.1	37.9	37.6	37.4	37.1	36.9	36.6
35	40.2	39.9	39.7	39.4	39.1	38.8	38.5	38.3	38.0	37.7
36	41.5	41.2	40.9	40.6	40.3	40.0	39.7	39.5	39.2	38.9
37	42.8	42.5	42.1	41.8	41.5	41.2	40.9	40.6	40.3	40.0
38	44.1	43.7	43.4	43.0	42.7	42.4	42.1	41.7	41.4	41.1
39	45.3	44.9	44.6	44.2	43.9	43.6	43.3	42.9	42.6	42.3
40	46.5	46.1	45.8	55.4	45.1	44.8	44.4	44.1	43.7	43.4
41	47.6	47.3	46.9	46.6	46.2	45.9	45.5	45.2	44.8	44.5
42	48.8	48.4	48.1	47.7	47.4	47.0	46.7	46.3	46.0	45.6
43	49.9	49.6	49.2	48.9	48.5	48.1	47.7	47.4	47.0	46.6
44	51.1	50.7	50.4	50.0	49.6	49.2	48.8	48.5	48.1	47.7
45	52.4	52.0	51.5	51.1	50.7	50.3	49.9	49.6	49.2	48.8
46	53.6	53.2	52.7	52.3	51.9	51.5	51.1	50.7	50.3	49.9
47	54.8	54.3	53.9	53.4	53.0	52.6	52.2	51.7	51.3	50.9
48	55.9	55.5	55.0	54.6	54.1	53.7	53.3	52.8	52.4	52.0
49	57.1	56.6	56.2	55.7	55.3	54.9	54.4	54.0	53.5	53.1
50	58.2	57.7	57.3	56.8	56.4	56.0	55.5	55.1	54.6	54.2
51	59.3	58.9	58.4	58.0	57.5	57.1	56.6	56.2	55.7	55.3
52	60.4	60.0	59.5	59.1	58.6	58.2	57.7	57.3	56.8	56.4
53	61.6	61.1	60.7	60.2	59.7	59.2	58.8	58.3	57.9	57.4
54	62.6	62.2	61.7	61.3	60.8	60.3	59.9	59.4	59.0	58.5
55	63.7	63.2	62.8	62.3	61.8	61.3	60.9	60.4	60.0	59.5
56	64.7	64.2	63.8	63.3	62.8	62.3	61.9	61.4	61.0	60.5
57	65.8	65.3	64.9	64.4	63.9	63.4	63.0	62.5	62.1	61.6
58	66.8	66.3	65.9	65.4	64.9	64.4	64.0	63.5	63.1	62.6
59	67.8	67.3	66.9	66.4	65.9	65.4	65.0	64.5	64.1	63.6
60	68.8	68.4	67.9	67.5	67.0	66.5	66.0	65.6	65.1	64.6
61	69.9	69.4	69.0	68.5	68.0	67.5	67.0	66.6	66.1	65.6
62	70.9	70.4	70.0	69.5	69.0	68.5	68.0	67.6	67.1	66.6
63	71.9	71.4	71.0	70.5	70.0	69.5	69.0	68.6	68.1	67.6
64	72.9	72.4	72.0	71.5	71.0	70.5	70.1	69.6	69.2	68.7
65	73.9	73.4	73.0	72.5	72.0	71.5	71.1	70.6	70.2	69.7

TRUE PER CENT.

Ind. 66 to 130.

Temp. 41° to 50°.

Indication.	TEMPERATURES.									
	41°	42°	43°	44°	45°	46°	47°	48°	49°	50°
66	75.0	74.5	74.0	73.5	73.0	72.5	72.1	71.6	71.2	70.7
67	76.0	75.5	75.0	74.5	74.0	73.5	73.1	72.6	72.2	71.7
68	76.9	76.5	76.0	75.6	75.1	74.6	74.1	73.7	73.2	72.7
69	77.9	77.4	77.0	76.5	76.1	75.6	75.1	74.7	74.2	73.7
70	78.9	78.4	78.0	77.5	77.1	76.6	76.1	75.7	75.2	74.7
71	79.8	79.4	78.9	78.5	78.0	77.5	77.1	76.6	76.2	75.7
72	80.8	80.3	79.9	79.4	79.0	78.5	78.1	77.6	77.2	76.7
73	81.7	81.3	80.8	80.4	80.0	79.5	79.1	78.6	88.2	77.7
74	82.7	82.2	81.8	81.3	80.9	80.4	80.0	79.5	79.1	78.6
75	83.6	83.2	82.7	82.3	81.8	81.4	80.9	80.5	80.0	79.6
76	84.6	84.1	83.7	83.2	82.8	82.4	81.9	81.5	81.0	80.6
77	85.5	85.0	84.6	84.1	83.7	83.3	82.8	82.4	81.9	81.5
78	86.5	86.0	85.6	85.1	84.7	84.3	83.8	83.4	82.9	82.5
79	87.5	87.0	86.6	86.1	85.7	85.3	84.8	84.4	83.9	83.5
80	88.4	88.0	87.5	87.1	86.7	86.2	85.8	85.3	84.9	84.4
81	89.3	88.9	88.4	88.0	87.6	87.2	86.7	86.3	85.8	85.4
82	90.3	89.9	89.4	89.0	88.6	88.2	87.7	87.3	86.8	86.4
83	91.3	90.9	90.4	90.0	89.6	89.2	88.7	88.3	87.8	87.4
84	92.3	91.9	91.4	91.0	90.6	90.2	89.7	89.3	88.8	88.4
85	93.3	92.8	92.4	91.9	91.5	91.1	90.7	90.2	89.8	89.4
86	94.2	93.8	93.3	92.9	92.5	92.1	91.7	91.2	90.8	90.4
87	95.2	94.8	94.3	93.9	93.5	93.1	92.7	92.2	91.8	91.4
88	96.1	95.7	95.3	94.9	94.5	94.1	93.6	93.2	92.7	92.3
89	97.1	96.7	96.2	95.8	95.4	95.0	94.6	94.1	93.7	93.3
90	98.0	97.6	97.2	96.8	96.4	96.0	95.6	95.1	94.7	94.3
91	99.0	98.6	98.1	97.7	97.3	96.9	96.5	96.1	95.7	95.3
92	99.9	99.5	99.1	98.7	98.3	97.9	97.5	97.0	96.6	96.2
93	100.9	100.5	100.1	99.7	99.3	98.9	98.5	98.0	97.6	97.2
94	101.9	101.5	101.1	100.7	100.3	99.9	99.5	99.0	98.6	98.2
95	102.8	102.4	102.0	101.6	101.2	100.8	100.4	100.0	99.6	99.2
96	103.8	103.4	103.0	102.6	102.2	101.8	101.4	101.0	100.6	100.2
97	104.8	104.4	104.0	103.6	103.2	102.8	102.4	102.0	101.6	101.2
98	105.8	105.4	105.0	104.6	104.2	103.8	103.4	103.0	102.6	102.2
99	106.7	106.3	105.9	105.5	105.1	104.7	104.3	103.9	103.5	103.1
100	107.7	107.3	106.9	106.5	106.1	105.7	105.3	104.9	104.5	104.1
101	108.6	108.2	107.9	107.5	107.1	106.7	106.3	105.9	105.5	105.1
102	109.6	109.2	108.8	108.4	108.0	107.6	107.2	106.8	106.4	106.0
103	110.5	110.1	109.8	109.4	109.0	108.6	108.2	107.8	107.4	107.0
104	111.5	111.1	110.8	110.4	110.0	109.6	109.2	108.8	108.4	108.0
105	112.5	112.1	111.8	111.4	111.0	110.6	110.2	109.8	109.4	109.0
106	113.4	113.0	112.7	112.3	111.9	111.5	111.1	110.8	110.4	110.0
107	114.4	114.0	113.7	113.3	112.9	112.5	112.1	111.8	111.4	111.0
108	115.4	115.0	114.7	114.3	113.9	113.5	113.1	112.8	112.4	112.0
109	116.4	116.0	115.7	115.3	114.9	114.5	114.1	113.8	113.4	113.0
110	117.4	117.0	116.6	116.2	115.8	115.4	115.0	114.7	114.3	113.9
111	118.3	117.9	117.6	117.2	116.8	116.4	116.0	115.7	115.3	114.9
112	119.3	118.9	118.6	118.2	117.8	117.4	117.0	116.7	116.3	115.9
113	120.3	119.9	119.6	119.2	118.8	118.4	118.0	117.7	117.3	116.9
114	121.2	120.8	120.5	120.1	119.7	119.3	119.0	118.6	118.3	117.9
115	122.2	121.8	121.5	121.1	120.7	120.3	120.0	119.6	119.3	118.9
116	123.2	122.8	122.5	122.1	121.7	121.3	121.0	120.6	120.3	119.9
117	124.2	123.8	123.5	123.1	122.7	122.3	121.9	121.6	121.2	120.8
118	125.2	124.8	124.5	124.1	123.7	123.3	122.9	122.6	122.2	121.8
119	126.1	125.8	125.4	125.1	124.7	124.3	123.9	123.6	123.2	122.8
120	127.1	126.8	126.4	126.1	125.7	125.3	124.9	124.6	124.2	123.8
121	128.1	127.8	127.4	127.1	126.7	126.3	125.9	125.6	125.2	124.8
122	129.1	128.8	128.4	128.1	127.7	127.3	126.9	126.6	126.2	125.8
123	130.1	129.8	129.4	129.1	128.7	128.3	127.9	127.6	127.2	126.8
124	131.1	130.7	130.4	130.0	129.6	129.2	128.9	128.5	128.2	127.8
125	132.1	131.7	131.4	131.0	130.6	130.2	129.9	129.5	129.2	128.8
126	133.1	132.7	132.4	132.0	131.6	131.2	130.9	130.5	130.2	129.8
127	134.0	133.7	133.3	133.0	132.6	132.2	131.9	131.5	131.2	130.8
128	135.0	134.7	134.3	134.0	133.6	133.2	132.9	132.5	132.2	131.8
129	135.9	135.6	135.2	134.9	134.5	134.1	133.8	133.4	133.1	132.7
130	136.9	136.6	136.2	135.9	135.5	135.1	134.8	134.4	134.1	133.7

TRUE PER CENT.

Ind. 131 to 197.

Temp. 41° to 50°.

Indication.	TEMPERATURES.									
	41°	42°	43°	44°	45°	46°	47°	48°	49°	50°
131	137.9	137.5	137.2	136.8	136.5	136.1	135.8	135.4	135.1	134.7
132	138.9	138.5	138.2	137.8	137.5	137.1	136.8	136.4	136.1	135.7
133	139.8	139.5	139.1	138.8	138.4	138.1	137.7	137.4	137.0	136.7
134	140.8	140.4	140.1	139.7	139.4	139.0	138.7	138.3	138.0	137.6
135	141.8	141.4	141.1	140.7	140.4	140.0	139.7	139.3	139.0	138.6
136	142.7	142.4	142.0	141.7	141.3	141.0	140.6	140.3	139.9	139.6
137	143.7	143.3	143.0	142.6	142.3	141.9	141.6	141.2	140.9	140.5
138	144.7	144.3	144.0	143.6	143.3	142.9	142.6	142.2	141.9	141.5
139	145.7	145.3	145.0	144.6	144.3	143.9	143.6	143.2	142.9	142.5
140	146.7	146.3	146.0	145.6	145.3	144.9	144.6	144.2	143.9	143.5
141	147.7	147.3	147.0	146.6	146.3	145.9	145.6	145.2	144.9	144.5
142	148.6	148.3	147.9	147.6	147.3	146.9	146.6	146.2	145.9	145.5
143	149.6	149.2	148.9	148.5	148.2	147.9	147.5	147.2	146.8	146.5
144	150.6	150.2	149.9	149.5	149.2	148.9	148.5	148.2	147.8	147.5
145	151.6	151.2	150.9	150.5	150.2	149.9	149.5	149.2	148.8	148.5
146	152.5	152.1	151.8	151.4	151.1	150.8	150.5	150.1	149.8	149.5
147	153.5	153.1	152.8	152.4	152.1	151.8	151.4	151.1	150.7	150.4
148	154.5	154.1	153.8	153.4	153.1	152.8	152.4	152.1	151.7	151.4
149	155.4	155.1	154.7	154.4	154.1	153.8	153.4	153.1	152.7	152.4
150	156.4	156.1	155.7	155.4	155.1	154.8	154.4	154.1	153.7	153.4
151	157.4	157.1	156.7	156.4	156.1	155.8	155.4	155.1	154.7	154.4
152	158.4	158.0	157.7	157.3	157.0	156.7	156.4	156.0	155.7	155.4
153	159.3	159.0	158.6	158.3	158.0	157.7	157.4	157.0	156.7	156.4
154	160.3	160.0	159.6	159.3	159.0	158.7	158.3	158.0	157.6	157.3
155	161.3	161.0	160.6	160.3	160.0	159.7	159.3	159.0	158.6	158.3
156	162.3	161.9	161.6	161.2	160.9	160.6	160.3	159.9	159.6	159.3
157	163.2	162.9	162.5	162.2	161.9	161.6	161.3	160.9	160.6	160.3
158	164.2	163.9	163.5	163.2	162.9	162.6	162.3	161.9	161.6	161.3
159	165.2	164.9	164.5	164.2	163.9	163.6	163.3	162.9	162.6	162.3
160	166.1	165.8	165.4	165.1	164.8	164.5	164.2	163.8	163.5	163.2
161	167.1	166.8	166.4	166.1	165.8	165.5	165.2	164.8	164.5	164.2
162	168.1	167.8	167.4	167.1	166.8	166.5	166.2	165.8	165.5	165.2
163	169.0	168.7	168.4	168.1	167.8	167.5	167.2	166.8	166.5	166.2
164	170.0	169.7	169.3	169.0	168.7	168.4	168.1	167.8	167.5	167.2
165	171.0	170.7	170.3	170.0	169.7	169.4	169.1	168.8	168.5	168.2
166	171.9	171.6	171.3	171.0	170.7	170.4	170.1	169.8	169.5	169.2
167	172.9	172.6	172.3	172.0	171.7	171.4	171.1	170.7	170.4	170.1
168	173.8	173.5	173.2	172.9	172.6	172.3	172.0	171.7	171.4	171.1
169	174.7	174.4	174.2	173.9	173.6	173.3	173.0	172.7	172.4	172.1
170	175.7	175.4	175.1	174.8	174.5	174.2	173.9	173.7	173.4	173.1
171	176.6	176.3	176.1	175.8	175.5	175.2	174.9	174.7	174.4	174.1
172	177.6	177.3	177.0	176.7	176.4	176.1	175.8	175.6	175.3	175.0
173	178.5	178.2	178.0	177.7	177.4	177.1	176.8	176.5	176.2	175.9
174	179.4	179.1	178.9	178.6	178.3	178.0	177.7	177.5	177.2	176.9
175	180.4	180.1	179.9	179.6	179.3	179.0	178.7	178.5	178.2	177.9
176	181.3	181.1	180.8	180.6	180.3	180.0	179.7	179.5	179.2	178.9
177	182.2	182.0	181.7	181.5	181.2	180.9	180.7	180.4	180.2	179.9
178	183.2	182.9	182.7	182.4	182.1	181.8	181.6	181.3	181.1	180.8
179	184.1	183.9	183.6	183.4	183.1	182.8	182.5	182.3	182.0	181.7
180	185.1	184.9	184.6	184.4	184.1	183.8	183.5	183.3	183.0	182.7
181	186.1	185.9	185.6	185.4	185.1	184.8	184.5	184.3	184.0	183.7
182	187.0	186.8	186.5	186.3	186.0	185.7	185.5	185.2	185.0	184.7
183	188.0	187.7	187.5	187.2	187.0	186.7	186.5	186.2	186.0	185.7
184	188.8	188.5	188.3	188.0	187.8	187.6	187.3	187.1	186.8	186.6
185	189.7	189.5	189.2	189.0	188.8	188.6	188.3	188.1	187.8	187.6
186	190.6	190.4	190.1	189.9	189.7	189.5	189.2	189.0	188.7	188.5
187	191.5	191.3	191.0	190.8	190.6	190.4	190.1	189.9	189.6	189.4
188	192.5	192.2	192.0	191.7	191.5	191.3	191.1	190.8	190.6	190.4
189	193.4	193.2	192.9	192.7	192.5	192.3	192.0	191.8	191.5	191.3
190	194.3	194.1	193.8	193.6	193.4	193.2	193.0	192.7	192.5	192.3
191	195.2	195.0	194.8	194.6	194.4	194.2	194.0	193.7	193.5	193.3
192	196.1	195.9	195.7	195.5	195.3	195.1	194.9	194.6	194.4	194.2
193	197.1	196.9	196.7	196.5	196.3	196.1	195.9	195.6	195.4	195.2
194	198.0	197.8	197.6	197.4	197.2	197.0	196.8	196.6	196.4	196.2
195	199.0	198.8	198.6	198.4	198.2	198.0	197.8	197.5	197.3	197.1
196	199.9	199.7	199.5	199.3	199.1	198.9	198.7	198.5	198.3	198.1
197	.....	.....	.....	.....	.....	199.9	199.7	199.5	199.3	199.1

TRUE PER CENT.

Ind. 1 to 65.

Temp. 51° to 60°.

Indication.	TEMPERATURES.									
	51°	52°	53°	54°	55°	56°	57°	58°	59°	60°
1	1.7	1.7	1.6	1.6	1.5	1.4	1.3	1.2	1.1	1.0
2	2.7	2.7	2.6	2.6	2.5	2.4	2.3	2.2	2.1	2.0
3	3.7	3.7	3.6	3.6	3.5	3.4	3.3	3.2	3.1	3.0
4	4.7	4.7	4.6	4.6	4.5	4.4	4.3	4.2	4.1	4.0
5	5.7	5.7	5.6	5.6	5.5	5.4	5.3	5.2	5.1	5.0
6	6.7	6.7	6.6	6.6	6.5	6.4	6.3	6.2	6.1	6.0
7	7.7	7.7	7.6	7.6	7.5	7.4	7.3	7.2	7.1	7.0
8	8.7	8.7	8.6	8.6	8.5	8.4	8.3	8.2	8.1	8.0
9	9.7	9.7	9.6	9.6	9.5	9.4	9.3	9.2	9.1	9.0
10	10.8	10.7	10.7	10.6	10.5	10.4	10.3	10.2	10.1	10.0
11	11.9	11.8	11.7	11.6	11.5	11.4	11.3	11.2	11.1	11.0
12	12.9	12.8	12.8	12.7	12.6	12.5	12.4	12.2	12.1	12.0
13	13.9	13.8	13.8	13.7	13.6	13.5	13.4	13.2	13.1	13.0
14	15.0	14.9	14.8	14.7	14.6	14.5	14.4	14.2	14.1	14.0
15	16.0	15.9	15.8	15.7	15.6	15.5	15.4	15.2	15.1	15.0
16	17.0	16.9	16.9	16.8	16.7	16.6	16.4	16.3	16.1	16.0
17	18.1	18.0	17.9	17.8	17.7	17.6	17.4	17.3	17.1	17.0
18	19.1	19.0	18.9	18.8	18.7	18.6	18.4	18.3	18.1	18.0
19	20.2	20.1	19.9	19.8	19.7	19.6	19.4	19.3	19.1	19.0
20	21.3	21.1	21.0	20.8	20.7	20.6	20.4	20.3	20.1	20.0
21	22.4	22.2	22.1	21.9	21.8	21.6	21.5	21.3	21.2	21.0
22	23.4	23.2	23.1	22.9	22.8	22.6	22.5	22.3	22.2	22.0
23	24.5	24.3	24.2	24.0	23.9	23.7	23.5	23.4	23.2	23.0
24	25.5	25.4	25.2	25.1	24.9	24.7	24.5	24.4	24.2	24.0
25	26.5	26.4	26.2	26.1	25.9	25.7	25.5	25.4	25.2	25.0
26	27.6	27.5	27.3	27.2	27.0	26.8	26.6	26.4	26.2	26.0
27	28.7	28.5	28.4	28.2	28.0	27.8	27.6	27.4	27.2	27.0
28	29.8	29.6	29.5	29.3	29.1	28.9	28.7	28.4	28.2	28.0
29	30.9	30.7	30.5	30.3	30.1	29.9	29.7	29.4	29.2	29.0
30	32.0	31.8	31.6	31.4	31.2	31.0	30.7	30.5	30.2	30.0
31	33.1	32.9	32.6	32.4	32.2	32.0	31.7	31.5	31.2	31.0
32	34.2	34.0	33.7	33.5	33.3	33.0	32.8	32.5	32.3	32.0
33	35.3	35.0	34.8	34.5	34.3	34.0	33.8	33.5	33.3	33.0
34	36.4	36.1	35.9	35.6	35.4	35.1	34.8	34.6	34.3	34.0
35	37.4	37.2	36.9	36.7	36.4	36.1	35.8	35.6	35.3	35.0
36	38.6	38.3	38.1	37.8	37.5	37.2	36.9	36.6	36.3	36.0
37	39.7	39.4	39.1	38.8	38.5	38.2	37.9	37.6	37.3	37.0
38	40.8	40.5	40.2	39.9	39.6	39.3	39.0	38.6	38.3	38.0
39	42.0	41.6	41.3	40.9	40.6	40.3	40.0	39.6	39.3	39.0
40	43.1	42.7	42.4	42.0	41.7	41.4	41.0	40.7	40.3	40.0
41	44.1	43.8	43.4	43.1	42.7	42.4	42.0	41.7	41.3	41.0
42	45.2	44.9	44.5	44.2	43.8	43.4	43.1	42.7	42.4	42.0
43	46.3	45.9	45.6	45.2	44.9	44.5	44.1	43.8	43.4	43.0
44	47.3	47.0	46.6	46.3	45.9	45.5	45.1	44.8	44.4	44.0
45	48.4	48.0	47.7	47.3	46.9	46.5	46.1	45.8	45.4	45.0
46	49.5	49.1	48.8	48.4	48.0	47.6	47.2	46.8	46.4	46.0
47	50.5	50.1	49.8	49.4	49.0	48.6	48.2	47.8	47.4	47.0
48	51.6	51.2	50.8	50.4	50.0	49.6	49.2	48.8	48.4	48.0
49	52.7	52.3	51.8	51.4	51.0	50.6	50.2	49.8	49.4	49.0
50	53.8	53.4	52.9	52.5	52.1	51.7	51.3	50.8	50.4	50.0
51	54.9	54.4	54.0	53.5	53.1	52.7	52.3	51.8	51.4	51.0
52	56.0	55.5	55.1	54.6	54.2	53.8	53.3	52.9	52.4	52.0
53	57.0	56.5	56.1	55.6	55.2	54.8	54.3	53.9	53.4	53.0
54	58.0	57.6	57.1	56.7	56.2	55.8	55.3	54.9	54.4	54.0
55	59.0	58.6	58.1	57.7	57.2	56.8	56.3	55.9	55.4	55.0
56	60.0	59.6	59.1	58.7	58.2	57.8	57.3	56.9	56.4	56.0
57	61.1	60.6	60.2	59.7	59.2	58.8	58.3	57.9	57.4	57.0
58	62.1	61.7	61.2	60.8	60.3	59.8	59.4	58.9	58.5	58.0
59	63.1	62.7	62.2	61.8	61.3	60.8	60.4	59.9	59.5	59.0
60	64.1	63.7	63.2	62.8	62.3	61.8	61.4	60.9	60.5	60.0
61	65.1	64.7	64.2	63.8	63.3	62.8	62.4	61.9	61.5	61.0
62	66.1	65.7	65.2	64.8	64.3	63.8	63.4	62.9	62.5	62.0
63	67.1	66.7	66.2	65.8	65.3	64.8	64.4	63.9	63.5	63.0
64	68.2	67.7	67.3	66.8	66.3	65.8	65.4	64.9	64.5	64.0
65	69.2	68.7	68.3	67.8	67.3	66.8	66.4	65.9	65.5	65.0

TRUE PER CENT.

Ind. 66 to 130.

Temp. 51° to 60°.

Indication.	TEMPERATURES.									
	51°	52°	53°	54°	55°	56°	57°	58°	59°	60°
66	70.2	69.7	69.3	68.8	68.3	67.8	67.4	66.9	66.5	66.0
67	71.2	70.7	70.3	69.8	69.3	68.8	68.4	67.9	67.5	67.0
68	72.2	71.7	71.3	70.8	70.3	69.8	69.4	68.9	68.5	68.0
69	73.2	72.7	72.3	71.8	71.3	70.8	70.4	69.9	69.5	69.0
70	74.2	73.7	73.3	72.8	72.3	71.8	71.4	70.9	70.5	70.0
71	75.2	74.7	74.3	73.8	73.3	72.8	72.4	71.9	71.5	71.0
72	76.2	75.7	75.3	74.8	74.3	73.8	73.4	72.9	72.5	72.0
73	77.2	76.7	76.3	75.8	75.3	74.8	74.4	73.9	73.5	73.0
74	78.1	77.7	77.2	76.8	76.3	75.8	75.4	74.9	74.5	74.0
75	79.1	78.7	78.2	77.8	77.3	76.8	76.4	75.9	75.5	75.0
76	80.1	79.7	79.2	78.8	78.3	77.8	77.4	76.9	76.5	76.0
77	81.1	80.6	80.2	79.7	79.3	78.8	78.4	77.9	77.5	77.0
78	82.1	81.6	81.2	80.7	80.3	79.8	79.4	78.9	78.5	78.0
79	83.1	82.6	82.2	81.7	81.3	80.8	80.4	79.9	79.5	79.0
80	84.0	83.6	83.1	82.7	82.3	81.8	81.4	80.9	80.5	80.0
81	85.0	84.6	84.1	83.7	83.3	82.8	82.4	81.9	81.5	81.0
82	86.0	85.5	85.1	84.6	84.2	83.8	83.3	82.9	82.4	82.0
83	87.0	86.5	86.1	85.6	85.2	84.8	84.3	83.9	83.4	83.0
84	88.0	87.5	87.1	86.6	86.2	85.8	85.3	84.9	84.4	84.0
85	89.0	88.5	88.1	87.6	87.2	86.8	86.3	85.9	85.4	85.0
86	90.0	89.5	89.1	88.6	88.2	87.8	87.3	86.9	86.4	86.0
87	91.0	90.5	90.1	89.6	89.2	88.8	88.3	87.9	87.4	87.0
88	91.9	91.5	91.0	90.6	90.2	89.8	89.3	88.9	88.4	88.0
89	92.9	92.5	92.0	91.6	91.2	90.8	90.3	89.9	89.4	89.0
90	93.9	93.4	93.0	92.5	92.1	91.7	91.3	90.8	90.4	90.0
91	94.9	94.4	94.0	93.5	93.1	92.7	92.3	91.8	91.4	91.0
92	95.8	95.4	94.9	94.5	94.1	93.7	93.3	92.8	92.4	92.0
93	96.8	96.4	95.9	95.5	95.1	94.7	94.3	93.8	93.4	93.0
94	97.8	97.4	96.9	96.5	96.1	95.7	95.3	94.8	94.4	94.0
95	98.8	98.4	97.9	97.5	97.1	96.7	96.3	95.8	95.4	95.0
96	99.8	99.4	98.9	98.5	98.1	97.7	97.3	96.8	96.4	96.0
97	100.8	100.4	99.9	99.5	99.1	98.7	98.3	97.8	97.4	97.0
98	101.8	101.4	100.9	100.5	100.1	99.7	99.3	98.8	98.4	98.0
99	102.7	102.3	101.9	101.5	101.1	100.7	100.3	99.8	99.4	99.0
100	103.7	103.3	102.9	102.5	102.1	101.7	101.3	100.8	100.4	100.0
101	104.7	104.3	103.9	103.5	103.1	102.7	102.3	101.8	101.4	101.0
102	105.6	105.2	104.8	104.4	104.0	103.6	103.2	102.8	102.4	102.0
103	106.6	106.2	105.8	105.4	105.0	104.6	104.2	103.8	103.4	103.0
104	107.6	107.2	106.8	106.4	106.0	105.6	105.2	104.8	104.4	104.0
105	108.6	108.2	107.8	107.4	107.0	106.6	106.2	105.8	105.4	105.0
106	109.6	109.2	108.8	108.4	108.0	107.6	107.2	106.8	106.4	106.0
107	110.6	110.2	109.8	109.4	109.0	108.6	108.2	107.8	107.4	107.0
108	111.6	111.2	110.8	110.4	110.0	109.6	109.2	108.8	108.4	108.0
109	112.6	112.2	111.8	111.4	111.0	110.6	110.2	109.8	109.4	109.0
110	113.5	113.1	112.8	112.4	112.0	111.6	111.2	110.8	110.4	110.0
111	114.5	114.1	113.8	113.4	113.0	112.6	112.2	111.8	111.4	111.0
112	115.5	115.1	114.8	114.4	114.0	113.6	113.2	112.8	112.4	112.0
113	116.5	116.1	115.8	115.4	115.0	114.6	114.2	113.8	113.4	113.0
114	117.5	117.1	116.7	116.3	115.9	115.5	115.1	114.8	114.4	114.0
115	118.5	118.1	117.7	117.3	116.9	116.5	116.1	115.8	115.4	115.0
116	119.5	119.1	118.7	118.3	117.9	117.5	117.1	116.8	116.4	116.0
117	120.4	120.0	119.7	119.3	118.9	118.5	118.1	117.8	117.4	117.0
118	121.4	121.0	120.7	120.3	119.9	119.5	119.1	118.8	118.4	118.0
119	122.4	122.0	121.7	121.3	120.9	120.5	120.1	119.8	119.4	119.0
120	123.4	123.0	122.7	122.3	121.9	121.5	121.1	120.8	120.4	120.0
121	124.4	124.0	123.7	123.3	122.9	122.5	122.1	121.8	121.4	121.0
122	125.4	125.0	124.7	124.3	123.9	123.5	123.1	122.8	122.4	122.0
123	126.4	126.0	125.7	125.3	124.9	124.5	124.1	123.8	123.4	123.0
124	127.4	127.0	126.7	126.3	125.9	125.5	125.1	124.8	124.4	124.0
125	128.4	128.0	127.7	127.3	126.9	126.5	126.1	125.8	125.4	125.0
126	129.4	129.0	128.7	128.3	127.9	127.5	127.1	126.8	126.4	126.0
127	130.4	130.0	129.7	129.3	128.9	128.5	128.1	127.8	127.4	127.0
128	131.4	131.0	130.7	130.3	129.9	129.5	129.1	128.8	128.4	128.0
129	132.3	132.0	131.6	131.3	130.9	130.5	130.1	129.8	129.4	129.0
130	133.3	132.9	132.6	132.2	131.8	131.4	131.1	130.7	130.4	130.0

TRUE PER CENT.

Ind. 1 to 65.

Temp. 61° to 70°

Indication.	TEMPERATURES.									
	61°	62°	63°	64°	65°	66°	67°	68°	69°	70°
1	0.9	0.8	0.7	0.6	0.5	0.3	0.2	0.0	-----	-----
2	1.9	1.8	1.7	1.6	1.5	1.3	1.2	1.0	0.9	0.7
3	2.9	2.8	2.7	2.6	2.5	2.3	2.2	2.0	1.9	1.7
4	3.9	3.8	3.6	3.5	3.4	3.3	3.1	3.0	2.8	2.7
5	4.9	4.8	4.6	4.5	4.4	4.3	4.1	4.0	3.8	3.7
6	5.9	5.8	5.6	5.5	5.4	5.3	5.1	5.0	4.8	4.7
7	6.9	6.8	6.6	6.5	6.4	6.3	6.1	6.0	5.8	5.7
8	7.9	7.8	7.6	7.5	7.4	7.3	7.1	7.0	6.8	6.7
9	8.9	8.8	8.6	8.5	8.4	8.3	8.1	8.0	7.8	7.7
10	9.9	9.7	9.6	9.4	9.3	9.2	9.0	8.9	8.7	8.6
11	10.9	10.7	10.6	10.4	10.3	10.2	10.0	9.9	9.7	9.6
12	11.9	11.7	11.6	11.4	11.3	11.1	11.0	10.8	10.7	10.5
13	12.9	12.7	12.6	12.4	12.3	12.1	12.0	11.8	11.7	11.5
14	13.9	13.7	13.6	13.4	13.3	13.1	12.9	12.8	12.6	12.4
15	14.9	14.7	14.6	14.4	14.3	14.1	13.9	13.8	13.6	13.4
16	15.8	15.7	15.5	15.4	15.2	15.0	14.8	14.7	14.5	14.3
17	16.8	16.7	16.5	16.4	16.2	16.0	15.8	15.7	15.5	15.3
18	17.8	17.7	17.5	17.4	17.2	17.0	16.8	16.7	16.5	16.3
19	18.8	18.7	18.5	18.4	18.2	18.0	17.8	17.6	17.4	17.2
20	19.8	19.6	19.5	19.3	19.1	18.9	18.7	18.6	18.4	18.2
21	20.8	20.6	20.4	20.2	20.0	19.8	19.6	19.5	19.3	19.1
22	21.8	21.6	21.4	21.2	21.0	20.8	20.6	20.4	20.2	20.0
23	22.8	22.6	22.4	22.2	22.0	21.8	21.6	21.3	21.1	20.9
24	23.8	23.6	23.4	23.2	23.0	22.8	22.6	22.3	22.1	21.9
25	24.8	24.6	24.4	24.2	24.0	23.8	23.5	23.3	23.0	22.8
26	25.8	25.6	25.3	25.1	24.9	24.7	24.5	24.2	24.0	23.8
27	26.8	26.6	26.3	26.1	25.9	25.7	25.4	25.2	24.9	24.7
28	27.8	27.6	27.3	27.1	26.9	26.7	26.4	26.2	25.9	25.7
29	28.8	28.5	28.3	28.0	27.8	27.6	27.3	27.1	26.8	26.6
30	29.8	29.5	29.3	29.0	28.8	28.5	28.3	28.0	27.8	27.5
31	30.7	30.5	30.2	30.0	29.7	29.4	29.2	28.9	28.7	28.4
32	31.7	31.5	31.2	31.0	30.7	30.4	30.1	29.9	29.6	29.3
33	32.7	32.5	32.2	32.0	31.7	31.4	31.1	30.8	30.5	30.2
34	33.7	33.4	33.2	32.9	32.6	32.3	32.0	31.8	31.5	31.2
35	34.7	34.4	34.2	33.9	33.6	33.3	33.0	32.7	32.4	32.1
36	35.7	35.4	35.2	34.9	34.6	34.3	34.0	33.6	33.3	33.0
37	36.7	36.4	36.1	35.8	35.5	35.2	34.9	34.6	34.3	34.0
38	37.7	37.4	37.1	36.8	36.5	36.2	35.9	35.5	35.2	34.9
39	38.7	38.4	38.0	37.7	37.4	37.1	36.8	36.4	36.1	35.8
40	39.7	39.3	39.0	38.6	38.3	38.0	37.7	37.3	37.0	36.7
41	40.7	40.3	40.0	39.6	39.3	39.0	38.6	38.3	37.9	37.6
42	41.6	41.3	40.9	40.6	40.2	39.9	39.5	39.2	38.8	38.5
43	42.6	42.3	41.9	41.6	41.2	40.8	40.5	40.1	39.8	39.4
44	43.6	43.2	42.9	42.5	42.1	41.7	41.4	41.0	40.7	40.3
45	44.6	44.2	43.9	43.5	43.1	42.7	42.3	42.0	41.6	41.2
46	45.6	45.2	44.9	44.5	44.1	43.7	43.3	42.9	42.5	42.1
47	46.6	46.2	45.8	45.4	45.0	44.6	44.2	43.8	43.4	43.0
48	47.6	47.2	46.7	46.3	45.9	45.5	45.1	44.7	44.3	43.9
49	48.6	48.2	47.7	47.3	46.9	46.5	46.1	45.7	45.3	44.9
50	49.6	49.2	48.7	48.3	47.9	47.5	47.1	46.6	46.2	45.8
51	50.6	50.2	49.7	49.3	48.9	48.5	48.1	47.6	47.2	46.8
52	51.6	51.2	50.7	50.3	49.9	49.5	49.1	48.6	48.2	47.8
53	52.6	52.2	51.7	51.3	50.9	50.5	50.1	49.6	49.2	48.8
54	53.6	53.2	52.7	52.3	51.9	51.5	51.1	50.6	50.2	49.8
55	54.6	54.1	53.7	53.2	52.8	52.4	52.0	51.5	51.1	50.7
56	55.6	55.1	54.7	54.2	53.8	53.4	53.0	52.5	52.1	51.7
57	56.6	56.1	55.7	55.2	54.8	54.4	53.9	53.5	53.0	52.6
58	57.6	57.1	56.7	56.2	55.8	55.4	54.9	54.5	54.0	53.6
59	58.6	58.1	57.7	57.2	56.8	56.3	55.9	55.4	55.0	54.5
60	59.5	59.1	58.6	58.2	57.7	57.3	56.8	56.4	55.9	55.5
61	60.5	60.1	59.6	59.2	58.7	58.3	57.8	57.4	56.9	56.5
62	61.5	61.1	60.6	60.2	59.7	59.3	58.8	58.4	57.9	57.5
63	62.5	62.1	61.6	61.2	60.7	60.3	59.8	59.4	58.9	58.5
64	63.5	63.1	62.6	62.2	61.7	61.3	60.8	60.4	59.9	59.5
65	64.5	64.1	63.6	63.2	62.7	62.3	61.8	61.4	60.9	60.5

TRUE PER CENT.

Ind. 66 to 130.

Temp. 61° to 70°.

Indication.	TEMPERATURES.									
	61°	62°	63°	64°	65°	66°	67°	68°	69°	70°
66	65.5	65.1	64.6	64.2	63.7	63.3	62.8	62.4	61.9	61.5
67	66.5	66.1	65.6	65.2	64.7	64.3	63.8	63.4	62.9	62.5
68	67.5	67.1	66.6	66.2	65.7	65.3	64.8	64.4	63.9	63.5
69	68.5	68.1	67.6	67.2	66.7	66.3	65.8	65.4	64.9	64.5
70	69.5	69.1	68.6	68.2	67.7	67.3	66.8	66.4	65.9	65.5
71	70.5	70.1	69.6	69.2	68.7	68.3	67.8	67.4	66.9	66.5
72	71.5	71.1	70.6	70.2	69.7	69.3	68.8	68.4	67.9	67.5
73	72.5	72.1	71.6	71.2	70.7	70.3	69.8	69.4	68.9	68.5
74	73.5	73.1	72.6	72.2	71.7	71.3	70.8	70.4	69.9	69.5
75	74.5	74.1	73.6	73.2	72.7	72.3	71.8	71.4	70.9	70.5
76	75.5	75.1	74.6	74.2	73.7	73.3	72.8	72.4	71.9	71.5
77	76.5	76.1	75.6	75.2	74.7	74.3	73.8	73.4	72.9	72.5
78	77.5	77.1	76.6	76.2	75.7	75.3	74.8	74.4	73.9	73.5
79	78.5	78.1	77.6	77.2	76.7	76.3	75.8	75.4	74.9	74.5
80	79.5	79.1	78.6	78.2	77.7	77.3	76.8	76.4	75.9	75.5
81	80.5	80.1	79.6	79.2	78.7	78.3	77.8	77.4	76.9	76.5
82	81.6	81.1	80.7	80.2	79.8	79.3	78.9	78.4	78.0	77.5
83	82.6	82.1	81.7	81.2	80.8	80.3	79.9	79.4	79.0	78.5
84	83.6	83.1	82.7	82.2	81.8	81.3	80.9	80.4	80.0	79.5
85	84.6	84.1	83.7	83.2	82.8	82.3	81.9	81.4	81.0	80.5
86	85.6	85.1	84.7	84.2	83.8	83.4	82.9	82.5	82.0	81.6
87	86.6	86.1	85.7	85.2	84.8	84.4	83.9	83.5	83.0	82.6
88	87.6	87.1	86.7	86.2	85.8	85.4	84.9	84.5	84.0	83.6
89	88.6	88.1	87.7	87.2	86.8	86.4	85.9	85.5	85.0	84.6
90	89.6	89.1	88.7	88.2	87.8	87.4	87.0	86.5	86.1	85.7
91	90.6	90.1	89.7	89.2	88.8	88.4	88.0	87.5	87.1	86.7
92	91.6	91.1	90.7	90.2	89.8	89.4	89.0	88.5	88.1	87.7
93	92.6	92.1	91.7	91.2	90.8	90.4	90.0	89.5	89.1	88.7
94	93.6	93.1	92.7	92.2	91.8	91.4	91.0	90.5	90.1	89.7
95	94.6	94.2	93.7	93.3	92.9	92.5	92.0	91.6	91.1	90.7
96	95.6	95.2	94.7	94.3	93.9	93.5	93.0	92.6	92.1	91.7
97	96.6	96.2	95.7	95.3	94.9	94.5	94.0	93.6	93.1	92.7
98	97.6	97.2	96.7	96.3	95.9	95.5	95.1	94.6	94.2	93.8
99	98.6	98.2	97.7	97.3	96.9	96.5	96.1	95.6	95.2	94.8
100	99.6	99.2	98.7	98.3	97.9	97.5	97.1	96.6	96.2	95.8
101	100.6	100.2	99.7	99.3	98.9	98.5	98.1	97.6	97.2	96.8
102	101.6	101.2	100.7	100.3	99.9	99.5	99.1	98.6	98.2	97.8
103	102.6	102.2	101.7	101.3	100.9	100.5	100.1	99.6	99.2	98.8
104	103.6	103.2	102.8	102.4	102.0	101.6	101.2	100.7	100.3	99.9
105	104.6	104.2	103.8	103.4	103.0	102.6	102.2	101.7	101.3	100.9
106	105.6	105.2	104.8	104.4	104.0	103.6	103.2	102.7	102.3	101.9
107	106.6	106.2	105.8	105.4	105.0	104.6	104.2	103.7	103.3	102.9
108	107.6	107.2	106.8	106.4	106.0	105.6	105.2	104.7	104.3	103.9
109	108.6	108.2	107.8	107.4	107.0	106.6	106.2	105.7	105.3	104.9
110	109.6	109.2	108.8	108.4	108.0	107.6	107.2	106.7	106.3	105.9
111	110.6	110.2	109.8	109.4	109.0	108.6	108.2	107.8	107.4	107.0
112	111.6	111.2	110.8	110.4	110.0	109.6	109.2	108.8	108.4	108.0
113	112.6	112.2	111.8	111.4	111.0	110.6	110.2	109.8	109.4	109.0
114	113.6	113.2	112.8	112.4	112.0	111.6	111.2	110.8	110.4	110.0
115	114.6	114.2	113.8	113.4	113.0	112.6	112.2	111.8	111.4	111.0
116	115.6	115.2	114.8	114.4	114.0	113.6	113.2	112.8	112.4	112.0
117	116.6	116.2	115.8	115.4	115.0	114.6	114.2	113.8	113.4	113.0
118	117.6	117.2	116.8	116.4	116.0	115.6	115.2	114.9	114.5	114.1
119	118.6	118.2	117.8	117.4	117.0	116.6	116.2	115.9	115.5	115.1
120	119.6	119.2	118.8	118.4	118.0	117.6	117.2	116.9	116.5	116.1
121	120.6	120.2	119.9	119.5	119.1	118.7	118.3	117.9	117.5	117.1
122	121.6	121.2	120.9	120.5	120.1	119.7	119.3	118.9	118.5	118.1
123	122.6	122.2	121.9	121.5	121.1	120.7	120.3	119.9	119.5	119.1
124	123.6	123.2	122.9	122.5	122.1	121.7	121.3	120.9	120.5	120.1
125	124.6	124.2	123.9	123.5	123.1	122.7	122.3	121.9	121.5	121.1
126	125.6	125.2	124.9	124.5	124.1	123.7	123.3	122.9	122.5	122.1
127	126.6	126.2	125.9	125.5	125.1	124.7	124.3	123.9	123.5	123.1
128	127.6	127.2	126.9	126.5	126.1	125.7	125.3	125.0	124.6	124.2
129	128.6	128.2	127.9	127.5	127.1	126.7	126.3	126.0	125.6	125.2
130	129.6	129.2	128.9	128.5	128.1	127.7	127.3	127.0	126.6	126.2

TRUE PER CENT.

Ind. 131 to 200.

Temp. 61° to 70°.

Indication.	TEMPERATURES.									
	61°	62°	63°	64°	65°	66°	67°	68°	69°	70°
131	130.6	130.2	129.9	129.5	129.1	128.7	128.3	128.0	127.6	127.2
132	131.6	131.2	130.9	130.5	130.1	129.7	129.3	129.0	128.6	128.2
133	132.6	132.2	131.9	131.5	131.1	130.7	130.4	130.0	129.7	129.3
134	133.6	133.2	132.9	132.5	132.1	131.7	131.4	131.0	130.7	130.3
135	134.6	134.2	133.9	133.5	133.1	132.7	132.4	132.0	131.7	131.3
136	135.6	135.2	134.9	134.5	134.1	133.7	133.4	133.0	132.7	132.3
137	136.6	136.2	135.9	135.5	135.1	134.7	134.4	134.0	133.7	133.3
138	137.6	137.3	136.9	136.6	136.2	135.8	135.4	135.1	134.7	134.3
139	138.6	138.3	137.9	137.6	137.2	136.8	136.4	136.1	135.7	135.3
140	139.6	139.3	138.9	138.6	138.2	137.8	137.5	137.1	136.8	136.4
141	140.6	140.3	139.9	139.6	139.2	138.8	138.5	138.1	137.8	137.4
142	141.6	141.3	140.9	140.6	140.2	139.8	139.5	139.1	138.8	138.4
143	142.6	142.3	141.9	141.6	141.2	140.8	140.5	140.1	139.8	139.4
144	143.7	143.3	143.0	142.6	142.3	141.9	141.5	141.2	140.8	140.4
145	144.7	144.3	144.0	143.6	143.3	142.9	142.5	142.2	141.8	141.4
146	145.7	145.3	145.0	144.6	144.3	143.9	143.5	143.2	142.8	142.4
147	146.7	146.3	146.0	145.6	145.3	144.9	144.5	144.2	143.8	143.4
148	147.7	147.3	147.0	146.6	146.3	145.9	145.5	145.2	144.8	144.4
149	148.7	148.3	148.0	147.6	147.3	146.9	146.6	146.2	145.9	145.5
150	149.7	149.3	149.0	148.6	148.3	147.9	147.6	147.2	146.9	146.5
151	150.7	150.3	150.0	149.6	149.3	148.9	148.6	148.2	147.9	147.5
152	151.7	151.3	151.0	150.6	150.3	149.9	149.6	149.2	148.9	148.5
153	152.7	152.3	152.0	151.6	151.3	150.9	150.6	150.2	149.9	149.5
154	153.7	153.3	153.0	152.6	152.3	151.9	151.6	151.2	150.9	150.5
155	154.7	154.3	154.0	153.6	153.3	152.9	152.6	152.2	151.9	151.5
156	155.7	155.3	155.0	154.6	154.3	154.0	153.6	153.3	152.9	152.6
157	156.7	156.3	156.0	155.6	155.3	155.0	154.6	154.3	153.9	153.6
158	157.7	157.3	157.0	156.6	156.3	156.0	155.6	155.3	154.9	154.6
159	158.7	158.3	158.0	157.6	157.3	157.0	156.6	156.3	155.9	155.6
160	159.7	159.3	159.0	158.6	158.3	158.0	157.7	157.3	157.0	156.7
161	160.7	160.3	160.0	159.6	159.3	159.0	158.7	158.3	158.0	157.7
162	161.7	161.3	161.0	160.6	160.3	160.0	159.7	159.3	159.0	158.7
163	162.7	162.4	162.0	161.7	161.4	161.1	160.7	160.4	160.0	159.7
164	163.7	163.4	163.0	162.7	162.4	162.1	161.7	161.4	161.0	160.7
165	164.7	164.4	164.0	163.7	163.4	163.1	162.7	162.4	162.0	161.7
166	165.7	165.4	165.0	164.7	164.4	164.1	163.7	163.4	163.0	162.7
167	166.7	166.4	166.0	165.7	165.4	165.1	164.8	164.4	164.1	163.8
168	167.7	167.4	167.0	166.7	166.4	166.1	165.8	165.4	165.1	164.8
169	168.7	168.4	168.0	167.7	167.4	167.1	166.8	166.4	166.1	165.8
170	169.7	169.4	169.0	168.7	168.4	168.1	167.8	167.4	167.1	166.8
171	170.7	170.4	170.0	169.7	169.4	169.1	168.8	168.4	168.1	167.8
172	171.7	171.4	171.0	170.7	170.4	170.1	169.8	169.5	169.2	168.9
173	172.7	172.4	172.1	171.8	171.5	171.2	170.9	170.5	170.2	169.9
174	173.7	173.4	173.1	172.8	172.5	172.2	171.9	171.5	171.2	170.9
175	174.7	174.4	174.1	173.8	173.5	173.2	172.9	172.6	172.3	172.0
176	175.7	175.4	175.1	174.8	174.5	174.2	173.9	173.6	173.3	173.0
177	176.7	176.4	176.1	175.8	175.5	175.2	174.9	174.7	174.4	174.1
178	177.7	177.4	177.1	176.8	176.5	176.2	175.9	175.7	175.4	175.1
179	178.7	178.4	178.1	177.8	177.5	177.2	176.9	176.7	176.4	176.1
180	179.7	179.4	179.2	178.9	178.6	178.3	178.0	177.7	177.4	177.1
181	180.7	180.4	180.2	179.9	179.6	179.3	179.0	178.8	178.5	178.2
182	181.7	181.4	181.2	180.9	180.6	180.3	180.0	179.8	179.5	179.2
183	182.7	182.4	182.2	181.9	181.6	181.3	181.0	180.8	180.5	180.2
184	183.7	183.4	183.2	182.9	182.6	182.3	182.0	181.8	181.5	181.2
185	184.7	184.4	184.2	183.9	183.6	183.3	183.1	182.8	182.6	182.3
186	185.7	185.5	185.2	185.0	184.7	184.4	184.1	183.9	183.6	183.3
187	186.7	186.5	186.2	186.0	185.7	185.4	185.1	184.9	184.6	184.3
188	187.8	187.5	187.3	187.0	186.8	186.5	186.2	186.0	185.7	185.4
189	188.8	188.5	188.3	188.0	187.8	187.5	187.3	187.0	186.8	186.5
190	189.8	189.5	189.3	189.0	188.8	188.6	188.3	188.1	187.8	187.6
191	190.8	190.5	190.3	190.0	189.8	189.6	189.3	189.1	188.8	188.6
192	191.8	191.6	191.3	191.1	190.9	190.7	190.4	190.2	189.9	189.7
193	192.8	192.6	192.3	192.1	191.9	191.7	191.4	191.2	190.9	190.7
194	193.8	193.6	193.3	193.1	192.9	192.7	192.4	192.2	191.9	191.7
195	194.8	194.6	194.3	194.1	193.9	193.7	193.5	193.2	193.0	192.8
196	195.8	195.6	195.3	195.1	194.9	194.7	194.5	194.2	194.0	193.8
197	196.8	196.6	196.4	196.2	196.0	195.8	195.5	195.3	195.0	194.8
198	197.8	197.6	197.4	197.2	197.0	196.8	196.6	196.3	196.1	195.9
199	198.8	198.6	198.4	198.2	198.0	197.8	197.6	197.3	197.1	196.9
200	199.8	199.6	199.4	199.2	199.0	198.8	198.6	198.3	198.1	197.9

TRUE PER CENT.

Ind. 2 to 65.

Temp. 71° to 80°.

Indication.	TEMPERATURES.									
	71°	72°	73°	74°	75°	76°	77°	78°	79°	80°
2	0.5	0.4	0.2	0.1	-----	-----	-----	-----	-----	-----
3	1.5	1.4	1.2	1.1	0.9	0.7	0.5	0.3	0.1	-----
4	2.5	2.4	2.2	2.1	1.9	1.7	1.5	1.4	1.2	1.0
5	3.5	3.4	3.2	3.1	2.9	2.7	2.5	2.4	2.2	2.0
6	4.5	4.4	4.2	4.1	3.9	3.7	3.5	3.3	3.1	2.9
7	5.5	5.3	5.2	5.0	4.8	4.6	4.4	4.3	4.1	3.9
8	6.5	6.3	6.2	6.0	5.8	5.6	5.4	5.2	5.0	4.8
9	7.5	7.3	7.2	7.0	6.8	6.6	6.4	6.2	6.0	5.8
10	8.4	8.2	8.1	7.9	7.7	7.5	7.3	7.1	6.9	6.7
11	9.4	9.2	9.1	8.9	8.7	8.5	8.3	8.1	7.9	7.7
12	10.3	10.1	10.0	9.8	9.6	9.4	9.2	9.0	8.8	8.6
13	11.3	11.1	10.9	10.7	10.5	10.3	10.1	9.8	9.6	9.4
14	12.2	12.0	11.8	11.6	11.4	11.2	11.0	10.7	10.5	10.3
15	13.2	13.0	12.7	12.5	12.3	12.1	11.9	11.6	11.4	11.2
16	14.1	13.9	13.7	13.5	13.3	13.1	12.8	12.6	12.3	12.1
17	15.1	14.9	14.7	14.5	14.3	14.1	13.8	13.6	13.3	13.1
18	16.1	15.9	15.6	15.4	15.2	15.0	14.8	14.5	14.3	14.1
19	17.0	16.8	16.6	16.4	16.2	16.0	15.7	15.5	15.2	15.0
20	18.0	17.8	17.5	17.3	17.1	16.9	16.7	16.4	16.2	16.0
21	18.9	18.7	18.4	18.2	18.0	17.8	17.5	17.3	17.0	16.8
22	19.8	19.6	19.3	19.1	18.9	18.6	18.4	18.1	17.9	17.6
23	20.7	20.4	20.2	19.9	19.7	19.5	19.2	19.0	18.7	18.5
24	21.6	21.4	21.1	20.9	20.6	20.3	20.1	19.8	19.6	19.3
25	22.5	22.3	22.0	21.8	21.5	21.2	21.0	20.7	20.5	20.2
26	23.5	23.3	23.0	22.8	22.5	22.2	21.9	21.7	21.4	21.1
27	24.4	24.2	23.9	23.7	23.4	23.1	22.8	22.6	22.3	22.0
28	25.4	25.1	24.9	24.6	24.3	24.0	23.7	23.5	23.2	22.9
29	26.3	26.0	25.8	25.5	25.2	24.9	24.6	24.4	24.1	23.8
30	27.2	26.9	26.7	26.4	26.1	25.8	25.5	25.3	25.0	24.7
31	28.1	27.8	27.6	27.3	27.0	26.7	26.4	26.1	25.8	25.5
32	29.0	28.7	28.5	28.2	27.9	27.6	27.3	27.0	26.7	26.4
33	29.9	29.6	29.4	29.1	28.8	28.5	28.2	27.8	27.5	27.2
34	30.9	30.6	30.3	30.0	29.7	29.4	29.1	28.7	28.4	28.1
35	31.8	31.5	31.2	30.9	30.6	30.3	30.0	29.6	29.3	29.0
36	32.7	32.4	32.1	31.8	31.5	31.2	30.8	30.5	30.1	29.8
37	33.7	33.4	33.0	32.7	32.4	32.1	31.7	31.4	31.0	30.7
38	34.6	34.3	33.9	33.6	33.3	32.9	32.6	32.2	31.9	31.5
39	35.5	35.2	34.8	34.5	34.2	33.8	33.5	33.1	32.8	32.4
40	36.4	36.1	35.7	35.4	35.1	34.7	34.4	34.0	33.7	33.3
41	37.3	37.0	36.6	36.3	36.0	35.6	35.3	34.9	34.6	34.2
42	38.2	37.8	37.5	37.1	36.8	36.5	36.1	35.8	35.4	35.1
43	39.1	38.7	38.4	38.0	37.7	37.3	37.0	36.6	36.3	35.9
44	39.9	39.6	39.2	38.9	38.5	38.1	37.8	37.4	37.1	36.7
45	40.8	40.5	40.1	39.8	39.4	39.0	38.7	38.3	38.0	37.6
46	41.7	41.3	40.9	40.5	40.1	39.8	39.4	39.1	38.7	38.4
47	42.6	42.2	41.9	41.5	41.1	40.7	40.3	40.0	39.6	39.2
48	43.5	43.1	42.8	42.4	42.0	41.6	41.2	40.8	40.4	40.0
49	44.5	44.1	43.6	43.2	42.8	42.4	42.0	41.7	41.3	40.9
50	45.4	45.0	44.5	44.1	43.7	43.3	42.9	42.5	42.1	41.7
51	46.4	45.9	45.5	45.0	44.6	44.2	43.8	43.3	42.9	42.5
52	47.4	46.9	46.5	46.0	45.6	45.2	44.7	44.3	43.8	43.4
53	48.4	47.9	47.5	47.0	46.6	46.1	45.7	45.2	44.8	44.3
54	49.3	48.9	48.4	48.0	47.5	47.1	46.6	46.2	45.7	45.3
55	50.3	49.8	49.4	48.9	48.5	48.0	47.6	47.1	46.7	46.2
56	51.3	50.8	50.4	49.9	49.5	49.0	48.6	48.1	47.7	47.2
57	52.2	51.8	51.3	50.9	50.5	50.0	49.6	49.1	48.7	48.2
58	53.2	52.7	52.3	51.8	51.4	51.0	50.5	50.1	49.6	49.2
59	54.1	53.7	53.2	52.8	52.4	52.0	51.5	51.1	50.6	50.2
60	55.1	54.6	54.2	53.7	53.3	52.9	52.4	52.0	51.5	51.1
61	56.1	55.6	55.2	54.7	54.3	53.9	53.4	53.0	52.5	52.1
62	57.1	56.6	56.2	55.7	55.3	54.8	54.4	53.9	53.5	53.0
63	58.1	57.6	57.2	56.7	56.3	55.8	55.4	54.9	54.5	54.0
64	59.0	58.6	58.1	57.7	57.2	56.8	56.3	55.9	55.4	55.0
65	60.0	59.6	59.1	58.7	58.2	57.8	57.3	56.9	56.4	56.0

TRUE PER CENT.

Ind. 66 to 130.

Temp. 71° to 80°.

Indication.	TEMPERATURES.									
	71°	72°	73°	74°	75°	76°	77°	78°	79°	80°
66	61.0	60.6	60.1	59.7	59.2	58.7	58.3	57.8	57.4	56.9
67	62.0	61.6	61.1	60.7	60.2	59.7	59.3	58.8	58.4	57.9
68	63.0	62.6	62.1	61.7	61.2	60.7	60.3	59.8	59.4	58.9
69	64.0	63.6	63.1	62.7	62.2	61.7	61.3	60.8	60.4	59.9
70	65.0	64.6	64.1	63.7	63.2	62.7	62.3	61.8	61.4	60.9
71	66.0	65.6	65.1	64.7	64.2	63.7	63.3	62.8	62.4	61.9
72	67.0	66.6	66.1	65.7	65.2	64.7	64.3	63.8	63.4	62.9
73	68.0	67.6	67.1	66.7	66.2	65.7	65.3	64.8	64.4	63.9
74	69.0	68.6	68.1	67.7	67.2	66.7	66.3	65.8	65.4	64.9
75	70.0	69.6	69.1	68.7	68.2	67.7	67.3	66.8	66.4	65.9
76	71.0	70.6	70.1	69.7	69.2	68.7	68.3	67.8	67.4	66.9
77	72.0	71.6	71.1	70.7	70.2	69.7	69.3	68.8	68.4	67.9
78	73.0	72.6	72.1	71.7	71.2	70.7	70.3	69.8	69.4	68.9
79	74.0	73.6	73.1	72.7	72.2	71.7	71.3	70.8	70.4	69.9
80	75.0	74.6	74.1	73.7	73.2	72.7	72.3	71.8	71.4	70.9
81	76.0	75.6	75.1	74.7	74.2	73.7	73.3	72.8	72.4	71.9
82	77.0	76.6	76.1	75.7	75.2	74.7	74.3	73.8	73.4	72.9
83	78.1	77.6	77.2	76.7	76.3	75.8	75.3	74.9	74.4	73.9
84	79.1	78.6	78.2	77.7	77.3	76.8	76.4	75.9	75.5	75.0
85	80.1	79.6	79.2	78.7	78.3	77.8	77.4	76.9	76.5	76.0
86	81.1	80.7	80.2	79.8	79.3	78.8	78.4	77.9	77.5	77.0
87	82.2	81.7	81.3	80.8	80.4	79.9	79.5	79.0	78.6	78.1
88	83.2	82.7	82.3	81.8	81.4	81.0	80.5	80.1	79.6	79.2
89	84.2	83.7	83.3	82.8	82.4	82.0	81.5	81.1	80.6	80.2
90	85.2	84.8	84.3	83.9	83.4	83.0	82.5	82.1	81.6	81.2
91	86.3	85.8	85.4	84.9	84.5	84.0	83.6	83.1	82.7	82.2
92	87.3	86.8	86.4	85.9	85.5	85.0	84.6	84.1	83.7	83.2
93	88.3	87.8	87.4	86.9	86.5	86.1	85.6	85.2	84.7	84.3
94	89.3	88.8	88.4	87.9	87.5	87.1	86.6	86.2	85.7	85.3
95	90.3	89.8	89.4	88.9	88.5	88.1	87.6	87.2	86.7	86.3
96	91.3	90.9	90.4	90.0	89.6	89.1	88.7	88.2	87.8	87.3
97	92.3	91.9	91.4	91.0	90.6	90.1	89.7	89.2	88.8	88.3
98	93.4	92.9	92.5	92.0	91.6	91.2	90.7	90.3	89.8	89.4
99	94.4	93.9	93.5	93.0	92.6	92.2	91.7	91.3	90.8	90.4
100	95.4	95.0	94.5	94.1	93.7	93.3	92.8	92.4	91.9	91.5
101	96.4	96.0	95.5	95.1	94.7	94.3	93.8	93.4	92.9	92.5
102	97.4	97.0	96.5	96.1	95.7	95.3	94.8	94.4	93.9	93.5
103	98.4	98.0	97.5	97.1	96.7	96.3	95.9	95.4	95.0	94.6
104	99.5	99.0	98.6	98.1	97.7	97.3	96.9	96.4	96.0	95.6
105	100.5	100.1	99.6	99.2	98.8	98.4	98.0	97.5	97.1	96.7
106	101.5	101.1	100.6	100.2	99.8	99.4	99.0	98.5	98.1	97.7
107	102.5	102.1	101.7	101.3	100.9	100.5	100.0	99.6	99.1	98.7
108	103.5	103.1	102.7	102.3	101.9	101.5	101.1	100.6	100.2	99.8
109	104.5	104.1	103.7	103.3	102.9	102.5	102.1	101.6	101.2	100.8
110	105.5	105.1	104.7	104.3	103.9	103.5	103.1	102.7	102.3	101.9
111	106.6	106.2	105.7	105.3	104.9	104.5	104.1	103.7	103.3	102.9
112	107.6	107.2	106.7	106.3	105.9	105.5	105.1	104.7	104.3	103.9
113	108.6	108.2	107.8	107.4	107.0	106.6	106.2	105.7	105.3	104.9
114	109.6	109.2	108.8	108.4	108.0	107.6	107.2	106.7	106.3	105.9
115	110.6	110.2	109.8	109.4	109.0	108.6	108.2	107.7	107.3	106.9
116	111.6	111.2	110.8	110.4	110.0	109.6	109.2	108.7	108.3	107.9
117	112.6	112.2	111.8	111.4	111.0	110.6	110.2	109.7	109.3	108.9
118	113.7	113.3	112.8	112.4	112.0	111.6	111.2	110.7	110.3	109.9
119	114.7	114.3	113.9	113.5	113.1	112.7	112.3	111.8	111.4	111.0
120	115.7	115.3	114.9	114.5	114.1	113.7	113.3	112.9	112.5	112.1
121	116.7	116.3	115.9	115.5	115.1	114.7	114.3	113.9	113.5	113.1
122	117.7	117.3	117.0	116.6	116.2	115.8	115.4	114.9	114.5	114.1
123	118.7	118.3	118.0	117.6	117.2	116.8	116.4	116.0	115.6	115.2
124	119.7	119.3	119.0	118.6	118.2	117.8	117.4	117.0	116.6	116.2
125	120.7	120.3	120.0	119.6	119.2	118.8	118.4	118.0	117.6	117.2
126	121.7	121.3	121.0	120.6	120.2	119.8	119.4	119.0	118.6	118.2
127	122.7	122.3	122.0	121.6	121.2	120.8	120.4	120.0	119.6	119.2
128	123.8	123.4	123.0	122.6	122.2	121.8	121.4	121.0	120.6	120.2
129	124.8	124.4	124.0	123.6	123.2	122.8	122.4	122.0	121.6	121.2
130	125.8	125.4	125.0	124.6	124.2	123.8	123.4	123.0	122.6	122.2

TRUE PER CENT.

Ind. 131 to 200.

Temp. 71° to 80°.

Indication.	TEMPERATURES.									
	71°	72°	73°	74°	75°	76°	77°	78°	79°	80°
131	126.8	126.4	126.0	125.6	125.2	124.8	124.4	124.0	123.6	123.2
132	127.8	127.4	127.1	126.7	126.3	125.9	125.5	125.1	124.7	124.3
133	128.9	128.5	128.1	127.7	127.3	126.9	126.5	126.1	125.7	125.3
134	129.9	129.5	129.1	128.7	128.3	127.9	127.5	127.2	126.8	126.4
135	130.9	130.5	130.2	129.8	129.4	129.0	128.6	128.2	127.8	127.4
136	131.9	131.5	131.2	130.8	130.4	130.0	129.6	129.3	128.9	128.5
137	132.9	132.5	132.2	131.8	131.4	131.0	130.6	130.3	129.9	129.5
138	133.9	133.5	133.2	132.8	132.4	132.0	131.6	131.3	130.9	130.5
139	134.9	134.5	134.2	133.8	133.4	133.0	132.6	132.3	131.9	131.5
140	136.0	135.6	135.3	134.9	134.5	134.1	133.7	133.4	133.0	132.6
141	137.0	136.6	136.3	135.9	135.5	135.1	134.7	134.4	134.0	133.6
142	138.0	137.6	137.3	136.9	136.5	136.1	135.8	135.4	135.1	134.7
143	139.0	138.6	138.3	137.9	137.5	137.1	436.8	136.4	136.1	135.7
144	140.0	139.7	139.3	139.0	138.6	138.2	137.8	137.5	137.1	136.7
145	141.0	140.7	140.3	140.0	139.6	139.2	138.8	138.5	138.1	137.7
146	142.0	141.7	141.3	141.0	140.6	140.2	139.8	139.5	139.1	138.7
147	143.0	142.7	142.3	142.0	141.6	141.2	140.8	140.5	140.1	139.7
148	144.0	143.7	143.3	143.0	142.6	142.2	141.9	141.5	141.2	140.8
149	145.1	144.8	144.4	144.1	143.7	143.3	142.9	142.6	142.2	141.8
150	146.1	145.8	145.4	145.1	144.7	144.3	143.9	143.6	143.2	142.8
151	147.1	146.8	146.4	146.1	145.7	145.3	145.0	144.6	144.3	143.9
152	148.1	147.8	147.4	147.1	146.7	146.3	146.0	145.6	145.3	144.9
153	149.2	148.8	148.5	148.1	147.8	147.4	147.0	146.7	146.3	145.9
154	150.2	149.8	149.5	149.1	148.8	148.4	148.0	147.7	147.3	146.9
155	151.2	150.8	150.5	150.1	149.8	149.4	149.1	148.7	148.4	148.0
156	152.2	151.9	151.5	151.2	150.8	150.4	150.1	149.7	149.4	149.0
157	153.3	152.9	152.6	152.2	151.9	151.5	151.1	150.8	150.4	150.0
158	154.3	153.9	153.6	153.2	152.9	152.5	152.2	151.8	151.5	151.1
159	155.3	154.9	154.6	154.2	153.9	153.5	153.2	152.8	152.5	152.1
160	156.3	156.0	155.6	155.3	154.9	154.6	154.2	153.9	153.5	153.2
161	157.4	157.0	156.7	156.3	156.0	155.6	155.3	154.9	154.6	154.2
162	158.4	158.0	157.7	157.3	157.0	156.7	156.3	156.0	155.6	155.3
163	159.4	159.0	158.7	158.3	158.0	157.7	157.3	157.0	156.6	156.3
164	160.4	160.0	159.7	159.3	159.0	158.7	158.3	158.0	157.6	157.3
165	161.4	161.1	160.7	160.4	160.1	159.8	159.4	159.1	158.7	158.4
166	162.4	162.1	161.7	161.4	161.1	160.8	160.4	160.1	159.7	159.4
167	163.5	163.1	162.8	162.4	162.1	161.8	161.4	161.1	160.7	160.4
168	164.5	164.1	163.8	163.4	163.1	162.8	162.5	162.1	161.8	161.5
169	165.5	165.2	164.8	164.5	164.2	163.9	163.5	163.2	162.8	162.5
170	166.5	166.2	165.8	165.5	165.2	164.9	164.5	164.2	163.8	163.5
171	167.5	167.2	166.8	166.5	166.2	165.9	165.6	165.2	164.9	164.6
172	168.6	168.2	167.9	167.5	167.2	166.9	166.6	166.2	165.9	165.6
173	169.6	169.3	168.9	168.6	168.3	168.0	167.7	167.3	167.0	166.7
174	170.6	170.3	169.9	169.6	169.3	169.0	168.7	168.3	168.0	167.7
175	171.7	171.4	171.0	170.7	170.4	170.1	169.8	169.4	169.1	168.8
176	172.7	172.4	172.0	171.7	171.4	171.1	170.8	170.4	170.1	169.8
177	173.8	173.5	173.1	172.8	172.5	172.2	171.9	171.5	171.2	170.9
178	174.8	174.5	174.1	173.8	173.5	173.2	172.9	172.6	172.3	172.0
179	175.8	175.5	175.2	174.9	174.6	174.3	174.0	173.6	173.3	173.0
180	176.8	176.5	176.2	175.9	175.6	175.3	175.0	174.7	174.4	174.1
181	177.9	177.6	177.3	177.0	176.7	176.4	176.1	175.8	175.5	175.2
182	178.9	178.6	178.3	178.0	177.7	177.4	177.1	176.8	176.5	176.2
183	179.9	179.6	179.3	179.1	178.8	178.5	178.2	177.9	177.6	177.3
184	180.9	180.6	180.4	180.1	179.8	179.5	179.2	179.0	178.7	178.4
185	182.0	181.7	181.4	181.1	180.8	180.5	180.2	180.0	179.7	179.4
186	183.0	182.7	182.5	182.2	181.9	181.6	181.3	181.1	180.8	180.5
187	184.0	183.8	183.5	183.3	183.0	182.7	182.4	182.1	181.8	181.5
188	185.1	184.9	184.6	184.4	184.1	183.8	183.5	183.2	182.9	182.6
189	186.2	186.0	185.7	185.5	185.2	184.9	184.6	184.4	184.1	183.8
190	187.3	187.1	186.8	186.6	186.3	186.0	185.8	185.5	185.3	185.0
191	188.4	188.1	187.9	187.6	187.4	187.1	186.9	186.6	186.4	186.1
192	189.4	189.2	188.9	188.7	188.4	188.2	187.9	187.7	187.4	187.2
193	190.5	190.2	190.0	189.7	189.5	189.3	189.0	188.8	188.5	188.3
194	191.5	191.3	191.0	190.8	190.6	190.4	190.1	189.9	189.6	189.4
195	192.6	192.3	192.1	191.8	191.6	191.4	191.2	190.9	190.7	190.5
196	193.6	193.4	193.1	192.9	192.7	192.5	192.2	192.0	191.7	191.5
197	194.6	194.4	194.1	193.9	193.7	193.5	193.3	193.0	192.8	192.6
198	195.7	195.5	195.2	195.0	194.8	194.6	194.4	194.1	193.9	193.7
199	196.7	196.5	196.3	196.1	195.9	195.7	195.4	195.2	194.9	194.7
200	197.7	197.5	197.3	197.1	196.9	196.7	196.5	196.2	196.0	195.8

TRUE PER CENT.

Ind. 4 to 65.

Temp. 81° to 90°.

Indication.	TEMPERATURES.									
	81°	82°	83°	84°	85°	86°	87°	88°	89°	90°
4	0.8	0.5	0.3	0.0	-----	-----	-----	-----	-----	-----
5	1.8	1.5	1.3	1.0	0.8	0.6	0.3	0.1	-----	-----
6	2.7	2.5	2.2	2.0	1.8	1.6	1.3	1.1	0.8	0.6
7	3.7	3.4	3.2	2.9	2.7	2.5	2.2	2.0	1.7	1.5
8	4.6	4.4	4.1	3.9	3.7	3.5	3.2	3.0	2.7	2.5
9	5.6	5.4	5.1	4.9	4.7	4.5	4.2	4.0	3.7	3.5
10	6.5	6.3	6.0	5.8	5.6	5.4	5.1	4.9	4.6	4.4
11	7.5	7.2	7.0	6.7	6.5	6.3	6.0	5.8	5.5	5.3
12	8.4	8.1	7.9	7.6	7.4	7.2	6.9	6.7	6.4	6.2
13	9.2	9.0	8.7	8.5	8.3	8.0	7.8	7.5	7.3	7.0
14	10.1	9.8	9.6	9.3	9.1	8.9	8.6	8.4	8.1	7.9
15	11.0	10.7	10.5	10.2	10.0	9.7	9.5	9.2	9.0	8.7
16	11.9	11.6	11.4	11.1	10.9	10.6	10.4	10.1	9.9	9.6
17	12.8	12.6	12.3	12.1	11.8	11.5	11.3	11.0	10.8	10.5
18	13.8	13.5	13.3	13.0	12.7	12.4	12.1	11.9	11.6	11.3
19	14.7	14.5	14.2	14.0	13.7	13.4	13.1	12.8	12.5	12.2
20	15.7	15.4	15.2	14.9	14.6	14.3	14.0	13.7	13.4	13.1
21	16.5	16.2	16.0	15.7	15.4	15.1	14.8	14.6	14.3	14.0
22	17.3	17.1	16.8	16.6	16.3	16.0	15.7	15.4	15.1	14.8
23	18.2	17.9	17.7	17.4	17.1	16.8	16.5	16.3	16.0	15.7
24	19.0	18.8	18.5	18.3	18.0	17.7	17.4	17.1	16.8	16.5
25	19.9	19.6	19.4	19.1	18.8	18.5	18.2	17.9	17.6	17.3
26	20.8	20.5	20.3	20.0	19.7	19.4	19.1	18.8	18.5	18.2
27	21.7	21.4	21.1	20.8	20.5	20.2	19.9	19.6	19.3	19.0
28	22.6	22.3	22.0	21.7	21.4	21.1	20.8	20.4	20.1	19.8
29	23.5	23.2	22.9	22.6	22.3	22.0	21.7	21.3	21.0	20.7
30	24.4	24.1	23.7	23.4	23.1	22.8	22.5	22.1	21.8	21.5
31	25.2	24.9	24.6	24.3	24.0	23.7	23.3	23.0	22.6	22.3
32	26.1	25.8	25.4	25.1	24.8	24.5	24.1	23.8	23.4	23.1
33	26.9	26.6	26.2	25.9	25.6	25.3	25.0	24.6	24.3	24.0
34	27.8	27.5	27.1	26.8	26.5	26.2	25.8	25.5	25.1	24.8
35	28.7	28.3	28.0	27.6	27.3	27.0	26.6	26.3	25.9	25.6
36	29.5	29.1	28.8	28.4	28.1	27.8	27.4	27.1	26.7	26.4
37	30.4	30.0	29.7	29.3	29.0	28.6	28.3	27.9	27.6	27.2
38	31.2	30.8	30.5	30.1	29.8	29.5	29.1	28.8	28.4	28.1
39	32.1	31.7	31.4	31.0	30.7	30.3	30.0	29.6	29.3	28.9
40	32.9	32.6	32.2	31.9	31.5	31.1	30.8	30.4	30.1	29.7
41	33.8	33.5	33.1	32.8	32.4	32.0	31.6	31.2	30.8	30.4
42	34.7	34.3	34.0	33.6	33.2	32.8	32.4	32.1	31.7	31.3
43	35.5	35.2	34.8	34.5	34.1	33.7	33.3	32.9	32.5	32.1
44	36.3	36.0	35.6	35.3	34.9	34.5	34.1	33.8	33.4	33.0
45	37.2	36.9	36.5	36.2	35.8	35.4	35.0	34.7	34.3	33.9
46	38.0	37.7	37.3	37.0	36.6	36.2	35.8	35.5	35.1	34.7
47	38.8	38.5	38.1	37.8	37.4	37.0	36.6	36.3	35.9	35.5
48	39.6	39.3	38.9	38.6	38.2	37.8	37.4	37.1	36.7	36.3
49	40.5	40.1	39.8	39.4	39.0	38.6	38.2	37.9	37.5	37.1
50	41.3	40.9	40.6	40.2	39.8	39.4	39.0	38.7	38.3	37.9
51	42.1	41.7	41.4	41.0	40.6	40.2	39.8	39.4	39.0	38.6
52	43.0	42.6	42.2	41.8	41.4	41.0	40.6	40.2	39.8	39.4
53	43.9	43.5	43.0	42.6	42.2	41.8	41.4	41.0	40.6	40.2
54	44.8	44.4	43.9	43.5	43.0	42.6	42.2	41.8	41.4	41.0
55	45.7	45.2	44.8	44.3	43.8	43.4	43.0	42.6	42.2	41.8
56	46.7	46.2	45.8	45.3	44.8	44.4	43.9	43.5	43.0	42.6
57	47.7	47.2	46.8	46.3	45.8	45.3	44.8	44.4	43.9	43.4
58	48.7	48.2	47.8	47.3	46.8	46.3	45.8	45.3	44.8	44.3
59	49.7	49.2	48.8	48.3	47.8	47.3	46.8	46.3	45.8	45.3
60	50.6	50.2	49.7	49.3	48.8	48.3	47.8	47.3	46.8	46.3
61	51.6	51.2	50.7	50.3	49.8	49.3	48.8	48.3	47.8	47.3
62	52.6	52.1	51.7	51.2	50.8	50.3	49.8	49.3	48.8	48.3
63	53.5	53.1	52.6	52.2	51.7	51.2	50.7	50.3	49.8	49.3
64	54.5	54.1	53.6	53.2	52.7	52.2	51.7	51.3	50.8	50.3
65	55.5	55.1	54.6	54.2	53.7	53.2	52.7	52.3	51.8	51.3

TRUE PER CENT.

Ind. 66 to 130.

Temp. 81 to 90°.

Indication.	TEMPERATURES.									
	81°	82°	83°	84°	85°	86°	87°	88°	89°	90°
66	56.5	56.0	55.6	55.1	54.7	54.2	53.7	53.3	52.8	52.3
67	57.4	57.0	56.5	56.1	55.6	55.1	54.7	54.2	53.8	53.3
68	58.4	58.0	57.5	57.1	56.6	56.1	55.7	55.2	54.8	54.3
69	59.4	59.0	58.5	58.1	57.6	57.1	56.7	56.2	55.8	55.3
70	60.4	60.0	59.5	59.1	58.6	58.1	57.7	57.2	56.8	56.3
71	61.4	61.0	60.5	60.1	59.6	59.1	58.7	58.2	57.8	57.3
72	62.5	62.0	61.6	61.1	60.7	60.2	59.7	59.3	58.8	58.3
73	63.5	63.0	62.6	62.1	61.7	61.2	60.7	60.3	59.8	59.3
74	64.5	64.0	63.6	63.1	62.7	62.2	61.8	61.3	60.9	60.4
75	65.5	65.0	64.6	64.1	63.7	63.2	62.8	62.3	61.9	61.4
76	66.5	66.0	65.6	65.1	64.7	64.2	63.8	63.3	62.9	62.4
77	67.5	67.0	66.6	66.1	65.7	65.2	64.8	64.3	63.9	63.4
78	68.5	68.0	67.6	67.1	66.7	66.2	65.8	65.3	64.9	64.4
79	69.5	69.0	68.6	68.1	67.7	67.3	66.8	66.4	65.9	65.5
80	70.5	70.0	69.6	69.1	68.7	68.3	67.8	67.4	66.9	66.5
81	71.5	71.0	70.6	70.1	69.7	69.3	68.8	68.4	67.9	67.5
82	72.5	72.0	71.6	71.1	70.7	70.3	69.8	69.4	68.9	68.5
83	73.5	73.0	72.6	72.1	71.7	71.3	70.8	70.4	69.9	69.5
84	74.5	74.1	73.6	73.2	72.7	72.3	71.8	71.4	70.9	70.5
85	75.5	75.1	74.6	74.2	73.7	73.3	72.8	72.4	71.9	71.5
86	76.5	76.1	75.6	75.2	74.7	74.3	73.8	73.4	72.9	72.5
87	77.6	77.1	76.7	76.2	75.7	75.3	74.8	74.4	73.9	73.5
88	78.7	78.2	77.8	77.3	76.8	76.3	75.9	75.4	75.0	74.5
89	79.7	79.2	78.8	78.3	77.8	77.3	76.9	76.4	76.0	75.5
90	80.7	80.3	79.8	79.4	78.9	78.4	77.9	77.5	77.0	76.5
91	81.8	81.3	80.9	80.4	80.0	79.5	79.0	78.6	78.1	77.6
92	82.8	82.4	81.9	81.5	81.1	80.6	80.1	79.7	79.2	78.7
93	83.9	83.4	83.0	82.5	82.1	81.6	81.2	80.7	80.3	79.8
94	84.9	84.4	84.0	83.5	83.1	82.7	82.2	81.8	81.3	80.9
95	85.9	85.4	85.0	84.5	84.1	83.7	83.2	82.8	82.3	81.9
96	86.9	86.4	86.0	85.5	85.1	84.7	84.3	83.8	83.4	83.0
97	87.9	87.4	87.0	86.5	86.1	85.7	85.3	84.8	84.4	84.0
98	88.9	88.5	88.0	87.6	87.1	86.7	86.3	85.8	85.4	85.0
99	90.0	89.5	89.1	88.6	88.2	87.8	87.3	86.9	86.4	86.0
100	91.0	90.6	90.1	89.7	89.2	88.8	88.3	87.9	87.4	87.0
101	92.1	91.6	91.2	90.7	90.3	89.8	89.4	88.9	88.5	88.0
102	93.1	92.7	92.2	91.8	91.4	90.9	90.5	90.0	89.6	89.1
103	94.2	93.7	93.3	92.8	92.4	92.0	91.5	91.1	90.6	90.2
104	95.2	94.8	94.3	93.9	93.5	93.1	92.6	92.2	91.7	91.3
105	96.3	95.8	95.4	94.9	94.5	94.1	93.6	93.2	92.7	92.3
106	97.3	96.8	96.4	95.9	95.5	95.1	94.7	94.2	93.8	93.4
107	98.3	97.9	97.4	97.0	96.6	96.2	95.7	95.3	94.8	94.4
108	99.4	98.9	98.5	98.0	97.6	97.2	96.8	96.3	95.9	95.5
109	100.4	100.0	99.5	99.1	98.7	98.3	97.8	97.4	96.9	96.5
110	101.5	101.0	100.6	100.1	99.7	99.3	98.9	98.4	98.0	97.6
111	102.5	102.1	101.6	101.2	100.8	100.4	99.9	99.5	99.0	98.6
112	103.5	103.1	102.6	102.2	101.8	101.4	101.0	100.5	100.1	99.7
113	104.5	104.1	103.6	103.2	102.8	102.4	102.0	101.5	101.1	100.7
114	105.5	105.1	104.7	104.3	103.9	103.5	103.1	102.6	102.2	101.8
115	106.5	106.1	105.7	105.3	104.9	104.5	104.1	103.6	103.2	102.8
116	107.5	107.1	106.7	106.3	105.9	105.5	105.1	104.6	104.2	103.8
117	108.5	108.1	107.7	107.3	106.9	106.5	106.1	105.6	105.2	104.8
118	109.5	109.1	108.7	108.3	107.9	107.5	107.1	106.7	106.3	105.9
119	110.6	110.2	109.7	109.3	108.9	108.5	108.1	107.7	107.3	106.9
120	111.7	111.2	110.8	110.3	109.9	109.5	109.1	108.7	108.3	107.9
121	112.7	112.3	111.8	111.4	111.0	110.6	110.2	109.7	109.3	108.9
122	113.7	113.3	112.9	112.5	112.1	111.7	111.2	110.8	110.3	109.9
123	114.8	114.4	113.9	113.5	113.1	112.7	112.3	111.8	111.4	111.0
124	115.8	115.4	115.0	114.6	114.2	113.8	113.4	112.9	112.5	112.1
125	116.8	116.4	116.0	115.6	115.2	114.8	114.4	113.9	113.5	113.1
126	117.8	117.4	117.0	116.6	116.2	115.8	115.4	115.0	114.6	114.2
127	118.8	118.4	118.1	117.7	117.3	116.9	116.5	116.0	115.6	115.2
128	119.8	119.4	119.1	118.7	118.3	117.9	117.5	117.1	116.7	116.3
129	120.8	120.4	120.1	119.7	119.3	118.9	118.5	118.1	117.7	117.3
130	121.8	121.4	121.1	120.7	120.3	119.9	119.5	119.1	118.7	118.3

TRUE PER CENT.

Ind. 131 to 200.

Temp. 81 to 90°.

Indication.	TEMPERATURES.									
	81°	82°	83°	84°	85°	86°	87°	88°	89°	90°
131	122.8	122.4	122.1	121.7	121.3	120.9	120.5	120.1	119.7	119.3
132	123.9	123.5	123.1	122.7	122.3	121.9	121.5	121.1	120.7	120.3
133	124.9	124.5	124.1	123.7	123.3	122.9	122.5	122.2	121.8	121.4
134	126.0	125.6	125.2	124.8	124.4	124.0	123.6	123.2	122.8	122.4
135	127.0	126.6	126.2	125.8	125.4	125.0	124.6	124.2	123.8	123.4
136	128.1	127.7	127.3	126.9	126.5	126.1	125.7	125.2	124.8	124.4
137	129.1	128.7	128.3	127.9	127.5	127.1	126.7	126.3	125.9	125.5
138	130.1	129.7	129.4	129.0	128.6	128.2	127.8	127.4	127.0	126.6
139	131.1	130.7	130.4	130.0	129.6	129.2	128.8	128.5	128.1	127.7
140	132.2	131.8	131.5	131.1	130.7	130.3	129.9	129.6	129.2	128.8
141	133.2	132.8	132.5	132.1	131.7	131.3	130.9	130.6	130.2	129.8
142	134.3	133.9	133.5	133.1	132.7	132.3	132.0	131.6	131.3	130.9
143	135.3	134.9	134.6	134.2	133.8	133.4	133.0	132.7	132.3	131.9
144	136.3	135.9	135.6	135.2	134.8	134.4	134.0	133.7	133.3	132.9
145	137.3	136.9	136.6	136.2	135.8	135.4	135.0	134.7	134.3	133.9
146	138.3	138.0	137.6	137.3	136.9	136.5	136.1	135.7	135.3	134.9
147	139.3	139.0	138.6	138.3	137.9	137.5	137.1	136.7	136.3	135.9
148	140.4	140.0	139.7	139.3	138.9	138.5	138.1	137.8	137.4	137.0
149	141.4	141.1	140.7	140.4	140.0	139.6	139.2	138.8	138.4	138.0
150	142.4	142.1	141.7	141.4	141.0	140.6	140.2	139.9	139.5	139.1
151	143.5	143.1	142.8	142.4	142.0	141.6	141.2	140.9	140.5	140.1
152	144.5	144.2	143.8	143.5	143.1	142.7	142.3	142.0	141.6	141.2
153	145.5	145.2	144.8	144.5	144.1	143.7	143.3	143.0	142.6	142.2
154	146.5	146.2	145.8	145.5	145.1	144.7	144.4	144.0	143.7	143.3
155	147.6	147.3	146.9	146.6	146.2	145.8	145.4	145.1	144.7	144.3
156	148.6	148.3	147.9	147.6	147.2	146.8	146.5	146.1	145.8	145.4
157	149.7	149.3	149.0	148.6	148.3	147.9	147.5	147.2	146.8	146.4
158	150.7	150.4	150.0	149.7	149.3	148.9	148.6	148.2	147.9	147.5
159	151.8	151.4	151.1	150.7	150.4	150.0	149.6	149.3	148.9	148.5
160	152.8	152.5	152.1	151.8	151.4	151.0	150.7	150.3	150.0	149.6
161	153.9	153.5	153.2	152.8	152.5	152.1	151.7	151.4	151.0	150.6
162	154.9	154.6	154.2	153.9	153.5	153.1	152.8	152.4	152.1	151.7
163	156.0	155.6	155.3	154.9	154.6	154.2	153.9	153.5	153.2	152.8
164	157.0	156.6	156.3	155.9	155.6	155.2	154.9	154.5	154.2	153.8
165	158.0	157.7	157.3	157.0	156.6	156.3	155.9	155.6	155.2	154.9
166	159.1	158.7	158.4	158.0	157.7	157.3	157.0	156.6	156.3	155.9
167	160.1	159.7	159.4	159.0	158.7	158.4	158.0	157.7	157.3	157.0
168	161.1	160.8	160.4	160.1	159.7	159.4	159.0	158.7	158.3	158.0
169	162.2	161.8	161.5	161.1	160.8	160.5	160.1	159.8	159.4	159.1
170	163.2	162.8	162.5	162.1	161.8	161.5	161.1	160.8	160.4	160.1
171	164.3	163.9	163.6	163.2	162.9	162.6	162.2	161.9	161.5	161.2
172	165.3	165.0	164.6	164.3	164.0	163.7	163.3	163.0	162.6	162.3
173	166.4	166.0	165.7	165.3	165.0	164.7	164.3	164.0	163.6	163.3
174	167.4	167.1	166.7	166.4	166.1	165.8	165.4	165.1	164.7	164.4
175	168.5	168.2	167.8	167.5	167.2	166.9	166.5	166.2	165.8	165.5
176	169.5	169.2	168.9	168.6	168.3	168.0	167.6	167.3	166.9	166.6
177	170.6	170.3	169.9	169.6	169.3	169.0	168.7	168.3	168.0	167.7
178	171.7	171.4	171.0	170.7	170.4	170.1	169.8	169.4	169.1	168.8
179	172.7	172.4	172.1	171.8	171.5	171.2	170.9	170.5	170.2	169.9
180	173.8	173.5	173.2	172.9	172.6	172.3	172.0	171.6	171.3	171.0
181	174.9	174.6	174.3	174.0	173.7	173.4	173.1	172.7	172.4	172.1
182	175.9	175.6	175.3	175.0	174.7	174.4	174.1	173.8	173.5	173.2
183	177.0	176.7	176.4	176.1	175.8	175.5	175.2	174.9	174.6	174.3
184	178.1	177.8	177.5	177.2	176.9	176.6	176.3	176.0	175.7	175.4
185	179.1	178.8	178.6	178.3	178.0	177.7	177.4	177.0	176.7	176.4
186	180.2	179.9	179.6	179.3	179.0	178.7	178.4	178.1	177.8	177.5
187	181.2	180.9	180.7	180.4	180.1	179.8	179.5	179.2	178.9	178.6
188	182.3	182.0	181.8	181.5	181.2	180.9	180.6	180.4	180.1	179.8
189	183.5	183.2	183.0	182.7	182.4	182.1	181.8	181.5	181.2	180.9
190	184.7	184.4	184.1	183.8	183.5	183.2	182.9	182.7	182.4	182.1
191	185.8	185.5	185.2	184.9	184.6	184.3	184.0	183.8	183.5	183.2
192	186.9	186.6	186.4	186.1	185.8	185.5	185.2	185.0	184.7	184.4
193	188.0	187.8	187.5	187.3	187.0	186.7	186.4	186.2	185.9	185.6
194	189.1	188.9	188.6	188.4	188.1	187.8	187.6	187.3	187.1	186.8
195	190.2	190.0	189.7	189.5	189.2	188.9	188.7	188.4	188.2	187.9
196	191.3	191.0	190.8	190.5	190.3	190.0	189.8	189.5	189.3	189.0
197	192.4	192.1	191.9	191.6	191.4	191.2	190.9	190.7	190.4	190.2
198	193.5	193.2	193.0	192.7	192.5	192.3	192.0	191.8	191.5	191.3
199	194.5	194.3	194.0	193.8	193.6	193.4	193.1	192.9	192.6	192.4
200	195.6	195.4	195.1	194.9	194.7	194.5	194.2	194.0	193.7	193.5

TRUE PER CENT.

Ind. 6 to 70.

Temp. 91 to 100°.

Indication.	TEMPERATURES.									
	91°	92°	93°	94°	95°	96°	97°	98°	99°	100°
6	0.3	0.0	0.7	0.5	0.2	0.9	0.6	0.3	0.0	0.7
7	1.2	1.0	1.7	1.5	1.2	1.8	1.5	1.3	1.0	1.6
8	2.2	2.0	2.7	2.4	2.1	2.7	2.4	2.2	1.9	2.5
9	3.2	2.9	3.6	3.3	3.0	3.6	3.3	3.1	2.8	3.3
10	4.1	3.8	4.5	4.2	3.9	4.5	4.2	3.9	3.6	4.1
11	5.0	4.7	5.4	5.1	4.8	5.3	5.0	4.7	4.4	5.0
12	5.9	5.6	6.2	5.9	5.6	6.2	5.9	5.6	5.3	5.8
13	6.7	6.4	7.1	6.8	6.5	7.0	6.7	6.4	6.1	6.6
14	7.6	7.3	7.9	7.6	7.3	7.8	7.5	7.2	6.9	7.5
15	8.4	8.1	8.7	8.4	8.1	8.7	8.4	8.1	7.8	8.3
16	9.3	9.0	9.6	9.3	9.0	9.6	9.3	8.9	8.6	9.1
17	10.2	9.9	10.5	10.2	9.9	10.4	10.1	9.7	9.4	10.0
18	11.0	10.7	11.3	11.0	10.7	11.3	11.0	10.6	10.3	10.8
19	11.9	11.6	12.2	11.9	11.6	12.2	11.8	11.5	11.1	11.6
20	12.8	12.5	13.1	12.8	12.5	13.0	12.6	12.3	11.9	12.4
21	13.7	13.4	13.9	13.6	13.3	13.8	13.4	13.1	12.7	13.2
22	14.5	14.2	14.7	14.4	14.1	14.6	14.2	13.9	13.5	14.0
23	15.4	15.1	15.5	15.2	14.9	15.4	15.0	14.7	14.3	14.8
24	16.2	15.9	16.3	16.0	15.7	16.2	15.8	15.5	15.1	15.6
25	17.0	16.7	17.2	16.8	16.5	17.0	16.7	16.3	16.0	16.4
26	17.9	17.5	18.0	17.7	17.4	17.8	17.5	17.1	16.8	17.2
27	18.7	18.4	18.8	18.5	18.2	18.6	18.3	17.9	17.6	18.0
28	19.5	19.2	19.7	19.3	19.0	19.4	19.1	18.7	18.4	18.8
29	20.4	20.0	20.5	20.1	19.8	20.2	19.9	19.5	19.2	19.5
30	21.2	20.8	21.3	20.9	20.6	21.0	20.6	20.3	19.9	20.3
31	22.0	21.6	22.1	21.7	21.4	21.8	21.4	21.1	20.7	21.1
32	22.8	22.4	22.9	22.6	22.2	22.6	22.2	21.9	21.5	21.9
33	23.6	23.3	23.7	23.4	23.0	23.4	23.0	22.7	22.3	22.7
34	24.4	24.1	24.5	24.2	23.8	24.2	23.8	23.5	23.1	23.5
35	25.2	24.9	25.3	25.0	24.6	25.0	24.6	24.3	23.9	24.3
36	26.0	25.7	26.1	25.8	25.4	25.8	25.4	25.1	24.7	25.0
37	26.8	26.5	27.0	26.6	26.2	26.6	26.2	25.8	25.4	25.8
38	27.7	27.3	27.8	27.4	27.0	27.4	27.0	26.6	26.2	26.6
39	28.5	28.1	28.6	28.2	27.8	28.2	27.8	27.4	27.0	27.4
40	29.3	28.9	29.3	29.0	28.6	29.0	28.6	28.2	27.8	28.2
41	30.0	29.7	30.2	29.8	29.4	29.8	29.4	29.0	28.6	28.9
42	30.9	30.5	31.0	30.6	30.2	30.6	30.2	29.7	29.3	29.7
43	31.7	31.3	31.8	31.4	31.0	31.4	31.0	30.5	30.1	30.6
44	32.6	32.2	32.6	32.2	31.8	32.3	31.9	31.4	31.0	31.4
45	33.5	33.1	33.5	33.1	32.7	33.1	32.7	32.2	31.8	32.2
46	34.3	33.9	34.3	33.9	33.5	33.9	33.5	33.0	32.6	33.0
47	35.1	34.7	35.1	34.7	34.3	34.7	34.3	33.8	33.4	33.8
48	35.9	35.5	35.9	35.5	35.1	35.5	35.1	34.6	34.2	34.6
49	36.7	36.3	36.7	36.3	35.9	36.3	35.9	35.4	35.0	35.5
50	37.5	37.1	37.5	37.1	36.7	37.1	36.7	36.3	35.9	36.3
51	38.2	37.8	38.3	37.9	37.5	37.8	37.4	37.1	36.7	37.0
52	39.0	38.6	39.0	38.6	38.2	38.6	38.2	37.8	37.4	37.8
53	39.8	39.4	39.8	39.4	39.0	39.4	39.0	38.6	38.2	38.5
54	40.6	40.2	40.6	40.2	39.8	40.1	39.7	39.3	38.9	39.3
55	41.4	41.0	41.3	40.9	40.5	40.9	40.5	40.1	39.7	40.1
56	42.2	41.8	42.1	41.7	41.3	41.7	41.3	40.9	40.5	40.8
57	43.0	42.6	42.5	42.1	41.7	42.1	41.7	41.6	41.2	41.6
58	43.9	43.4	43.4	43.0	42.9	43.3	42.9	42.4	42.0	42.3
59	44.8	44.3	44.7	44.2	43.7	44.2	43.7	43.3	42.8	43.1
60	45.8	45.3	45.2	44.7	44.2	45.2	44.7	44.1	43.6	44.1
61	46.8	46.3	46.7	46.2	45.7	46.2	45.7	45.1	44.6	45.1
62	47.8	47.3	47.7	47.2	46.7	47.3	46.7	46.2	45.6	46.2
63	48.8	48.3	48.8	48.3	47.8	48.4	47.8	47.3	46.7	47.3
64	49.8	49.3	49.9	49.4	48.9	49.5	48.9	48.4	47.8	48.4
65	50.8	50.3	50.5	50.0	49.5	50.5	50.0	49.4	48.9	49.6
66	51.8	51.4	51.9	51.5	51.0	51.5	51.0	50.6	50.1	50.6
67	52.8	52.4	52.9	52.5	52.0	52.5	52.0	51.6	51.1	51.6
68	53.8	53.4	53.9	53.5	53.0	53.5	53.0	52.6	52.1	52.6
69	54.8	54.4	54.9	54.5	54.0	54.5	54.0	53.5	53.0	53.5
70	55.8	55.4	55.9	55.5	55.0	55.5	55.0	54.5	54.0	54.5

TRUE PER CENT.

Ind. 71 to 135.

Temp. 91° to 100°.

Indication.	TEMPERATURES.									
	91°	92°	93°	94°	95°	96°	97°	98°	99°	100°
71	56.8	56.4	55.9	55.5	55.0	54.5	54.1	53.6	53.2	52.7
72	57.8	57.4	56.9	56.5	56.0	55.5	55.1	54.6	54.2	53.7
73	58.8	58.4	57.9	57.5	57.0	56.5	56.1	55.6	55.2	54.7
74	59.9	59.5	59.0	58.6	58.1	57.6	57.1	56.7	56.2	55.7
75	60.9	60.5	60.0	59.6	59.1	58.6	58.1	57.7	57.2	56.7
76	61.9	61.5	61.0	60.6	60.1	59.6	59.1	58.7	58.2	57.7
77	63.0	62.5	62.1	61.6	61.2	60.7	60.2	59.8	59.3	58.8
78	64.0	63.5	63.1	62.6	62.2	61.7	61.2	60.8	60.3	59.8
79	65.0	64.6	64.1	63.7	63.2	62.7	62.3	61.8	61.4	60.9
80	66.0	65.6	65.1	64.7	64.2	63.7	63.3	62.8	62.4	61.9
81	67.0	66.6	66.1	65.7	65.2	64.7	64.3	63.8	63.4	62.9
82	68.0	67.6	67.1	66.7	66.2	65.8	65.3	64.9	64.4	64.0
83	69.0	68.6	68.1	67.7	67.2	66.8	66.3	65.9	65.4	65.0
84	70.1	69.6	69.2	68.7	68.3	67.8	67.4	66.9	66.5	66.0
85	71.1	70.6	70.2	69.7	69.3	68.9	68.4	68.0	67.5	67.1
86	72.1	71.6	71.2	70.7	70.3	69.9	69.4	69.0	68.5	68.1
87	73.1	72.6	72.2	71.7	71.3	70.9	70.4	70.0	69.5	69.1
88	74.1	73.6	73.2	72.7	72.3	71.9	71.4	71.0	70.5	70.1
89	75.1	74.6	74.2	73.7	73.3	72.9	72.4	72.0	71.5	71.1
90	76.1	75.6	75.2	74.7	74.3	73.9	73.4	73.0	72.5	72.1
91	77.1	76.7	76.2	75.8	75.3	74.9	74.4	74.0	73.5	73.1
92	78.2	77.7	77.3	76.8	76.3	75.9	75.4	75.0	74.5	74.1
93	79.3	78.8	78.4	77.9	77.4	76.9	76.5	76.0	75.6	75.1
94	80.4	79.9	79.5	79.0	78.5	78.0	77.5	77.1	76.6	76.1
95	81.5	81.0	80.6	80.1	79.7	79.2	78.7	78.2	77.7	77.2
96	82.6	82.1	81.7	81.2	80.8	80.3	79.8	79.3	78.8	78.3
97	83.6	83.1	82.7	82.2	81.8	81.3	80.9	80.4	80.0	79.5
98	84.6	84.1	83.7	83.2	82.8	82.4	81.9	81.5	81.0	80.6
99	85.6	85.1	84.7	84.2	83.8	83.4	83.0	82.5	82.1	81.7
100	86.6	86.1	85.7	85.2	84.8	84.4	84.0	83.5	83.1	82.7
101	87.6	87.1	86.7	86.2	85.8	85.4	85.0	84.5	84.1	83.7
102	88.7	88.2	87.8	87.3	86.9	86.5	86.0	85.6	85.1	84.7
103	89.7	89.3	88.8	88.4	87.9	87.5	87.0	86.6	86.1	85.7
104	90.8	90.4	89.9	89.5	89.0	88.5	88.1	87.6	87.2	86.7
105	91.9	91.4	91.0	90.5	90.1	89.6	89.2	88.7	88.3	87.8
106	93.0	92.5	92.1	91.6	91.2	90.7	90.3	89.8	89.4	88.9
107	94.0	93.6	93.1	92.7	92.3	91.8	91.4	90.9	90.5	90.0
108	95.1	94.6	94.2	93.7	93.3	92.9	92.4	92.0	91.5	91.1
109	96.1	95.6	95.2	94.7	94.3	93.9	93.5	93.0	92.6	92.2
110	97.2	96.7	96.3	95.8	95.4	95.0	94.5	94.1	93.6	93.2
111	98.2	97.7	97.3	96.8	96.4	96.0	95.6	95.1	94.7	94.3
112	99.3	98.8	98.4	97.9	97.5	97.1	96.6	96.2	95.7	95.3
113	100.3	99.8	99.4	98.9	98.5	98.1	97.7	97.2	96.8	96.4
114	101.4	100.9	100.5	100.0	99.6	99.2	98.8	98.3	97.9	97.5
115	102.4	102.0	101.5	101.1	100.7	100.3	99.8	99.4	98.9	98.5
116	103.4	103.0	102.5	102.1	101.7	101.3	100.9	100.4	100.0	99.6
117	104.4	104.0	103.6	103.2	102.8	102.4	102.0	101.5	101.1	100.7
118	105.5	105.1	104.6	104.2	103.8	103.4	103.0	102.5	102.1	101.7
119	106.5	106.1	105.6	105.2	104.8	104.4	104.0	103.6	103.2	102.8
120	107.5	107.1	106.7	106.3	105.9	105.5	105.1	104.6	104.2	103.8
121	108.5	108.1	107.7	107.3	106.9	106.5	106.1	105.6	105.2	104.8
122	109.5	109.1	108.7	108.3	107.9	107.5	107.1	106.7	106.3	105.9
123	110.6	110.2	109.7	109.3	108.9	108.5	108.1	107.7	107.3	106.9
124	111.7	111.2	110.8	110.3	109.9	109.5	109.1	108.7	108.3	107.9
125	112.7	112.3	111.8	111.4	111.0	110.6	110.2	109.7	109.3	108.9
126	113.8	113.4	112.9	112.5	112.1	111.7	111.2	110.8	110.3	109.9
127	114.8	114.4	114.0	113.6	113.2	112.8	112.3	111.9	111.4	111.0
128	115.9	115.5	115.0	114.6	114.2	113.8	113.3	112.9	112.4	112.0
129	116.9	116.5	116.0	115.6	115.2	114.8	114.4	113.9	113.5	113.1
130	117.9	117.5	117.1	116.7	116.3	115.9	115.5	115.0	114.6	114.2
131	118.9	118.5	118.1	117.7	117.3	116.9	116.5	116.1	115.7	115.3
132	119.9	119.5	119.2	118.8	118.4	118.0	117.6	117.2	116.8	116.4
133	121.0	120.6	120.2	119.8	119.4	119.0	118.6	118.2	117.8	117.4
134	122.0	121.6	121.2	120.8	120.4	120.0	119.6	119.2	118.8	118.4
135	123.0	122.6	122.2	121.8	121.4	121.0	120.6	120.2	119.8	119.4

TRUE PER CENT.

Ind. 136 to 200.

Temp. 91° to 100°.

Indication.	TEMPERATURES.									
	91°	92°	93°	94°	95°	96°	97°	98°	99°	100°
136	124.0	123.6	123.2	122.8	122.4	122.0	121.6	121.2	120.8	120.4
137	125.1	124.7	124.3	123.9	123.5	123.1	122.7	122.3	121.9	121.5
138	126.2	125.8	125.3	124.9	124.5	124.1	123.7	123.3	122.9	122.5
139	127.3	126.9	126.4	126.0	125.6	125.2	124.8	124.3	123.9	123.5
140	128.4	128.0	127.5	127.1	126.7	126.3	125.9	125.4	125.0	124.6
141	129.4	129.0	128.6	128.2	127.8	127.4	127.0	126.5	126.1	125.7
142	130.5	130.1	129.7	129.3	128.9	128.5	128.1	127.6	127.2	126.8
143	131.5	131.1	130.7	130.3	129.9	129.5	129.1	128.7	128.3	127.9
144	132.5	132.1	131.8	131.4	131.0	130.6	130.2	129.8	129.4	129.0
145	133.5	133.1	132.8	132.4	132.0	131.6	131.2	130.9	130.5	130.1
146	134.5	134.1	133.8	133.4	133.0	132.6	132.2	131.9	131.5	131.1
147	135.5	135.2	134.8	134.5	134.1	133.7	133.3	132.9	132.5	132.1
148	136.6	136.2	135.9	135.5	135.1	134.7	134.3	134.0	133.6	133.2
149	137.6	137.2	136.9	136.5	136.1	135.7	135.3	135.0	134.6	134.2
150	138.7	138.3	138.0	137.6	137.2	136.8	136.4	136.0	135.6	135.2
151	139.7	139.3	139.0	138.6	138.2	137.8	137.4	137.1	136.7	136.3
152	140.8	140.4	140.1	139.7	139.3	138.9	138.5	138.1	137.7	137.3
153	141.8	141.4	141.1	140.7	140.3	139.9	139.5	139.1	138.7	138.3
154	142.9	142.5	142.2	141.8	141.4	141.0	140.6	140.2	139.8	139.4
155	143.9	143.5	143.2	142.8	142.4	142.0	141.6	141.3	140.9	140.5
156	145.0	144.6	144.3	143.9	143.5	143.1	142.7	142.4	142.0	141.6
157	146.0	145.7	145.3	145.0	144.6	144.2	143.8	143.5	143.1	142.7
158	147.1	146.7	146.4	146.0	145.6	145.2	144.8	144.5	144.1	143.7
159	148.1	147.8	147.4	147.1	146.7	146.3	145.9	145.6	145.2	144.8
160	149.2	148.9	148.5	148.2	147.8	147.4	147.0	146.7	146.3	145.9
161	150.2	149.9	149.5	149.2	148.8	148.4	148.1	147.7	147.4	147.0
162	151.3	151.0	150.6	150.3	149.9	149.5	149.2	148.8	148.5	148.1
163	152.4	152.1	151.7	151.4	151.0	150.6	150.2	149.9	149.5	149.1
164	153.4	153.1	152.7	152.4	152.0	151.6	151.3	150.9	150.6	150.2
165	154.5	154.2	153.8	153.5	153.1	152.7	152.4	152.0	151.7	151.3
166	155.5	155.2	154.8	154.5	154.1	153.7	153.4	153.0	152.7	152.3
167	156.6	156.3	155.9	155.6	155.2	154.8	154.5	154.1	153.8	153.4
168	157.7	157.3	157.0	156.6	156.3	155.9	155.6	155.2	154.9	154.5
169	158.7	158.4	158.0	157.7	157.3	157.0	156.6	156.3	155.9	155.6
170	159.8	159.4	159.1	158.7	158.4	158.0	157.7	157.3	157.0	156.6
171	160.8	160.5	160.1	159.8	159.4	159.1	158.7	158.4	158.0	157.7
172	161.9	161.6	161.2	160.9	160.5	160.2	159.8	159.5	159.1	158.8
173	163.0	162.6	162.3	161.9	161.6	161.3	160.9	160.6	160.2	159.9
174	164.1	163.7	163.4	163.0	162.7	162.4	162.0	161.7	161.3	161.0
175	165.2	164.8	164.5	164.1	163.8	163.5	163.1	162.8	162.4	162.1
176	166.3	165.9	165.6	165.2	164.9	164.6	164.2	163.9	163.5	163.2
177	167.4	167.0	166.7	166.3	166.0	165.7	165.4	165.0	164.7	164.4
178	168.5	168.1	167.8	167.4	167.1	166.8	166.5	166.1	165.8	165.5
179	169.6	169.3	168.9	168.6	168.3	168.0	167.6	167.3	166.9	166.6
180	170.7	170.4	170.0	169.7	169.4	169.1	168.7	168.4	168.0	167.7
181	171.8	171.5	171.1	170.8	170.5	170.2	169.9	169.5	169.2	168.9
182	172.9	172.6	172.2	171.9	171.6	171.3	171.0	170.6	170.3	170.0
183	174.0	173.7	173.3	173.0	172.7	172.4	172.1	171.7	171.4	171.1
184	175.1	174.8	174.4	174.1	173.8	173.5	173.2	172.8	172.5	172.2
185	176.1	175.8	175.5	175.2	174.9	174.6	174.3	173.9	173.6	173.3
186	177.2	176.9	176.6	176.3	176.0	175.7	175.4	175.0	174.7	174.4
187	178.3	178.0	177.8	177.5	177.2	176.9	176.6	176.2	175.9	175.6
188	179.5	179.2	178.9	178.6	178.3	178.0	177.7	177.4	177.1	176.8
189	180.6	180.3	180.1	179.8	179.5	179.2	178.9	178.6	178.3	178.0
190	181.8	181.5	181.2	180.9	180.6	180.3	180.0	179.8	179.5	179.2
191	182.9	182.6	182.4	182.1	181.8	181.5	181.2	181.0	180.7	180.4
192	184.1	183.8	183.6	183.3	183.0	182.7	182.4	182.2	181.9	181.6
193	185.3	185.0	184.8	184.5	184.2	183.9	183.6	183.4	183.1	182.8
194	186.5	186.2	186.0	185.7	185.4	185.1	184.8	184.6	184.3	184.0
195	187.6	187.4	187.1	186.9	186.6	186.3	186.0	185.8	185.5	185.2
196	188.8	188.5	188.3	188.0	187.8	187.5	187.2	187.0	186.7	186.4
197	189.9	189.7	189.4	189.2	188.9	188.6	188.4	188.1	187.9	187.6
198	191.1	190.8	190.6	190.3	190.1	189.8	189.6	189.3	189.1	188.8
199	192.2	191.9	191.7	191.4	191.2	190.9	190.7	190.4	190.2	189.9
200	193.3	193.0	192.8	192.5	192.3	192.1	191.8	191.6	191.3	191.1

CORRECTIONS TO VOLUME.

This table gives the correction to 100 gallons of spirits, to be added when measured at temperatures below 60°, and to be subtracted when measured above 60° Fahrenheit.

Indication.	TEMPERATURES.										
	0°	10°	20°	30°	40°	50°	60°	70°	80°	90°	100°
5				.08	.09	.07	0.0	.11	.25	.43	.66
10				.09	.10	.07	0.0	.11	.26	.45	.68
15				.11	.12	.08	0.0	.12	.28	.47	.71
20				.15	.14	.09	0.0	.13	.29	.50	.74
25				.20	.17	.10	0.0	.14	.32	.54	.80
30				.25	.20	.12	0.0	.16	.35	.58	.85
35				.32	.25	.14	0.0	.18	.39	.64	.93
40				.41	.31	.17	0.0	.20	.44	.71	1.02
45				.50	.36	.20	0.0	.23	.49	.77	1.09
50				.57	.41	.22	0.0	.24	.52	.82	1.14
55	1.11	.96	.80	.66	.47	.24	0.0	.27	.56	.89	1.23
60	1.32	1.14	.96	.76	.53	.27	0.0	.29	.61	.95	1.30
65	1.52	1.31	1.09	.84	.58	.29	0.0	.32	.66	1.02	1.39
70	1.74	1.48	1.20	.93	.64	.33	0.0	.34	.71	1.09	1.48
75	1.95	1.65	1.37	1.02	.69	.35	0.0	.37	.75	1.16	1.56
80	2.10	1.78	1.45	1.08	.73	.37	0.0	.39	.79	1.20	1.63
85	2.22	1.87	1.52	1.14	.77	.39	0.0	.41	.83	1.26	1.70
90	2.32	1.95	1.58	1.19	.80	.41	0.0	.42	.86	1.30	1.77
95	2.42	2.03	1.64	1.23	.83	.42	0.0	.44	.88	1.34	1.81
100	2.50	2.09	1.69	1.27	.86	.43	0.0	.45	.91	1.38	1.86
105	2.56	2.14	1.73	1.31	.88	.45	0.0	.46	.93	1.41	1.91
110	2.63	2.20	1.77	1.34	.91	.46	0.0	.47	.95	1.45	1.96
115	2.68	2.25	1.81	1.37	.92	.47	0.0	.48	.97	1.47	1.99
120	2.73	2.29	1.85	1.39	.94	.48	0.0	.49	.98	1.50	2.02
125	2.78	2.34	1.88	1.42	.96	.48	0.0	.50	1.00	1.52	2.05
130	2.84	2.39	1.93	1.44	.97	.49	0.0	.51	1.02	1.53	2.08
135	2.89	2.43	1.96	1.48	.99	.50	0.0	.52	1.04	1.57	2.12
140	2.94	2.47	1.99	1.49	1.01	.51	0.0	.52	1.05	1.60	2.15
145	3.00	2.51	2.03	1.51	1.02	.51	0.0	.53	1.06	1.61	2.17
150	3.05	2.55	2.06	1.54	1.03	.52	0.0	.53	1.08	1.63	2.20
155	3.09	2.59	2.09	1.55	1.05	.53	0.0	.54	1.09	1.65	2.22
160	3.14	2.62	2.11	1.59	1.07	.54	0.0	.55	1.11	1.67	2.25
165	3.18	2.66	2.14	1.62	1.08	.55	0.0	.55	1.12	1.69	2.27
170	3.22	2.69	2.18	1.64	1.10	.55	0.0	.56	1.13	1.71	2.29
175	3.25	2.72	2.21	1.66	1.11	.56	0.0	.57	1.14	1.73	2.32
180	3.29	2.76	2.23	1.68	1.12	.57	0.0	.58	1.16	1.75	2.35
185	3.34	2.80	2.26	1.69	1.13	.57	0.0	.58	1.17	1.77	2.38
190	3.38	2.83	2.28	1.71	1.15	.58	0.0	.59	1.18	1.80	2.42
195	3.42	2.86	2.31	1.72	1.16	.59	0.0	.59	1.20	1.82	2.44
200	3.46	2.90	2.33	1.74	1.18	.60	0.0	.60	1.21	1.84	2.46

TABLE II.—*For finding the number of gallons at 60° Fahr. from the weight and strength of spirituous liquor.*

EXAMPLE.—A cask of spirits of 141 per cent. strength, (or 41 above proof,) weighed 913 pounds. We find
900 pounds = 121.54 gallons.
10 " = 1.35 "
3 " = 0.40 "
123.29
or contents,
supposed to be measured at 60° Fahr.

The equivalent gallons for 10 pounds are found from the column 100 pounds by moving the decimal point one place to the left; those for 3 pounds from the column 300 pounds by moving the decimal point two places to the left.

GALLONS BY WEIGHT AND STRENGTH OF SPIRIT.

Per cent.	Pounds.									
	100.	200.	300.	400.	500.	600.	700.	800.	900.	1000.
	Galls.	Galls.	Galls.	Galls.	Galls.	Galls.	Galls.	Galls.	Galls.	Galls.
2	12.02	24.04	36.06	48.08	60.10	72.12	84.14	96.16	108.18	120.20
4	.04	.07	.11	.15	.18	.22	.26	.30	.33	.37
6	.05	.11	.16	.22	.27	.32	.38	.43	.49	.54
8	.07	.14	.21	.29	.36	.43	.50	.57	.64	.71
10	.09	.18	.27	.35	.44	.53	.62	.71	.80	.89
12	12.10	24.21	36.31	48.42	60.52	72.63	84.73	96.84	108.94	121.04
14	.12	.24	.36	.48	.60	.72	.84	.96	109.08	.20
16	.13	.27	.40	.54	.67	.81	.94	97.08	.21	.35
18	.15	.30	.45	.60	.75	.90	85.05	.20	.35	.50
20	.17	.33	.50	.66	.83	.99	.16	.32	.49	.65
22	12.18	24.36	36.54	48.72	60.90	73.07	85.25	97.43	109.61	121.79
24	.19	.39	.58	.77	.96	.16	.35	.54	.74	.93
26	.21	.41	.62	.83	61.03	.24	.45	.65	.86	122.07
28	.22	.44	.66	.88	.10	.32	.54	.76	.98	.20
30	.23	.47	.70	.93	.17	.40	.63	.87	110.10	.34
32	12.25	24.49	36.74	48.99	61.23	73.48	85.72	97.97	110.22	122.46
34	.26	.52	.78	49.04	.30	.56	.82	98.07	.33	.59
36	.27	.54	.82	.09	.36	.63	.91	.18	.45	.72
38	.29	.57	.86	.14	.43	.71	86.00	.28	.57	.85
40	.30	.60	.89	.19	.49	.79	.09	.38	.68	.98
42	12.31	24.62	36.93	49.24	61.55	73.86	86.18	98.49	110.80	123.11
44	.32	.65	.97	.29	.62	.94	.27	.59	.91	.24
46	.34	.67	37.01	.35	.68	74.02	.36	.70	111.03	.37
48	.35	.70	.05	.40	.75	.10	.45	.80	.15	.50
50	.36	.73	.09	.45	.81	.18	.54	.90	.27	.63
52	12.38	24.75	37.13	49.51	61.88	74.26	86.64	99.01	111.39	123.76
54	.39	.78	.17	.56	.95	.34	.73	.12	.51	.90
56	.40	.81	.21	.61	62.02	.42	.83	.23	.63	124.04
58	.42	.84	.25	.67	.09	.51	.93	.35	.76	.18
60	.43	.87	.30	.73	.16	.60	87.03	.46	.90	.33
62	12.45	24.90	37.34	49.79	62.24	74.69	87.13	99.58	112.03	124.48
64	.46	.93	.39	.85	.32	.78	.25	.71	.17	.64
66	.48	.96	.44	.92	.40	.88	.36	.84	.32	.80
68	.50	.99	.49	.99	.48	.98	.48	.97	.47	.97
70	.51	25.03	.54	50.06	.57	75.08	.60	100.11	.63	125.14
72	12.53	25.06	37.60	50.13	62.66	75.19	87.72	100.25	112.79	125.32
74	.55	.10	.65	.20	.75	.30	.85	.40	.96	.51
76	.57	.14	.71	.28	.85	.42	.99	.56	113.12	.69
78	.59	.18	.77	.36	.95	.54	88.12	.71	.30	.89
80	.61	.22	.83	.44	63.05	.65	.26	.87	.48	126.09
82	12.63	25.26	37.89	50.52	63.15	75.78	88.41	101.04	113.67	126.30
84	.65	.30	.96	.61	.26	.91	.56	.22	.87	.52
86	.67	.35	38.02	.70	.37	76.05	.72	.40	114.07	.74
88	.70	.39	.09	.79	.49	.18	.88	.58	.27	.97
90	.72	.44	.16	.88	.60	.32	89.04	.76	.48	127.20
92	12.74	25.49	38.23	50.98	63.72	76.46	89.21	101.95	114.70	127.44
94	.77	.54	.31	51.07	.84	.61	.38	102.15	.92	.69
96	.79	.59	.38	.18	.97	.76	.56	.35	115.15	.94
98	.82	.64	.46	.28	64.10	.92	.74	.56	.38	128.20
100	.85	.69	.54	.38	.23	77.08	.92	.77	.61	.46

Water 100 pounds = 12.00 gallons.

TABLE II—Continued.

GALLONS BY WEIGHT AND STRENGTH OF SPIRIT.

Per cent.	Pounds.									
	100.	200.	300.	400.	500.	600.	700.	800.	900.	1000.
	<i>Galls.</i>	<i>Galls.</i>	<i>Galls.</i>	<i>Galls.</i>	<i>Galls.</i>	<i>Galls.</i>	<i>Galls.</i>	<i>Galls.</i>	<i>Galls.</i>	<i>Galls.</i>
101	12.86	25.72	38.58	51.44	64.30	77.15	90.01	102.87	115.73	128.59
102	.87	.74	.62	.49	.36	.23	.11	.98	.85	.72
103	.89	.77	.66	.55	.43	.32	.20	103.09	.96	.86
104	.90	.80	.70	.60	.50	.40	.30	.20	116.10	129.00
105	.91	.83	.74	.66	.57	.49	.40	.32	.23	.14
106	12.93	25.86	38.79	51.71	64.64	77.57	90.50	103.43	116.36	129.29
107	.94	.89	.83	.77	.71	.66	.60	.54	.49	.43
108	.96	.91	.87	.83	.79	.74	.70	.66	.61	.57
109	.97	.94	.91	.89	.86	.83	.80	.77	.74	.72
110	.99	.97	.96	.94	.93	.92	.90	.89	.88	.86
111	13.00	26.00	39.00	52.00	65.01	78.01	91.01	104.01	117.01	130.01
112	.02	.03	.05	.06	.08	.09	.11	.13	.14	.16
113	.03	.06	.09	.12	.15	.19	.22	.25	.28	.31
114	.05	.09	.14	.18	.23	.28	.32	.37	.41	.46
115	.06	.12	.18	.25	.31	.37	.43	.49	.55	.61
116	13.08	26.15	39.23	52.31	65.38	78.46	91.54	104.61	117.69	130.77
117	.09	.18	.28	.37	.46	.55	.65	.74	.83	.92
118	.11	.22	.32	.43	.54	.65	.76	.86	.97	131.08
119	.12	.25	.37	.50	.62	.74	.87	.99	118.11	.24
120	.14	.28	.42	.56	.70	.84	.98	105.12	.26	.40
121	13.16	26.31	39.47	52.62	65.78	78.94	92.09	105.25	118.40	131.56
122	.17	.34	.52	.69	.86	79.03	.21	.38	.55	.72
123	.19	.38	.57	.75	.94	.13	.32	.51	.70	.88
124	.20	.41	.61	.82	66.02	.23	.43	.64	.84	132.05
125	.22	.44	.66	.89	.11	.33	.55	.77	.99	.21
126	13.24	26.48	39.71	52.95	66.19	79.43	92.66	105.90	119.14	132.38
127	.25	.51	.76	53.02	.27	.53	.78	106.04	.29	.55
128	.27	.54	.81	.09	.36	.63	.90	.17	.44	.71
129	.29	.58	.86	.15	.44	.73	93.02	.31	.59	.88
130	.31	.61	.92	.22	.53	.83	.14	.44	.75	133.05
131	13.32	26.65	39.97	53.29	66.61	79.94	93.26	106.58	119.90	133.23
132	.34	.68	40.02	.36	.70	80.04	.38	.72	120.06	.40
133	.36	.72	.07	.43	.79	.15	.50	.86	.22	.58
134	.38	.75	.13	.50	.88	.25	.63	107.00	.38	.76
135	.39	.79	.18	.57	.97	.36	.75	.15	.54	.94
136	13.41	26.82	40.24	53.65	67.06	80.47	93.88	107.29	120.71	134.12
137	.43	.86	.29	.72	.15	.58	94.01	.44	.87	.30
138	.45	.90	.34	.79	.24	.69	.14	.58	121.03	.48
139	.47	.94	.40	.87	.34	.81	.27	.74	.21	.68
140	.49	.97	.46	.94	.43	.91	.40	.89	.37	.86
141	13.50	27.01	40.51	54.02	67.52	81.03	94.53	108.04	121.54	135.05
142	.52	.05	.57	.10	.62	.14	.67	.19	.71	.24
143	.54	.09	.63	.17	.72	.26	.80	.34	.89	.43
144	.56	.12	.69	.25	.81	.37	.94	.50	122.06	.62
145	.58	.16	.75	.33	.91	.49	95.07	.65	.24	.82
146	13.60	27.20	40.80	54.41	68.01	81.61	95.21	108.81	122.41	136.01
147	.62	.24	.86	.48	.11	.73	.35	.97	.59	.21
148	.64	.28	.92	.56	.21	.85	.49	109.13	.77	.41
149	.66	.32	.98	.65	.31	.97	.63	.29	.95	.61
150	.68	.36	41.04	.73	.41	82.09	.77	.45	123.13	.82
151	13.70	27.40	41.11	54.81	68.51	82.21	95.91	109.62	123.32	137.02
152	.72	.45	.17	.89	.61	.34	96.06	.78	.50	.23
153	.74	.49	.23	.97	.72	.46	.20	.95	.69	.44
154	.76	.53	.29	55.06	.82	.59	.35	110.12	.88	.65
155	.79	.57	.36	.14	.93	.71	.50	.29	124.07	.86
156	13.81	27.61	41.42	55.23	69.03	82.84	96.65	110.46	124.26	138.07
157	.83	.66	.49	.31	.14	.97	.80	.63	.46	.29
158	.85	.70	.55	.40	.25	83.10	.95	.80	.66	.51
159	.87	.75	.62	.49	.36	.24	97.11	.98	.85	.73
160	.89	.79	.68	.58	.47	.37	.26	111.16	125.05	.95

Water 100 pounds = 12.00 gallons.

TABLE II—Continued.

GALLONS BY WEIGHT AND STRENGTH OF SPIRIT.

Per cent.	Pounds.									
	100.	200.	300.	400.	500.	600.	700.	800.	900.	1000.
	Galls.	Galls.	Galls.	Galls.	Galls.	Galls.	Galls.	Galls.	Galls.	Galls.
161	13.92	27.83	41.75	55.67	69.59	83.50	97.42	111.34	125.26	139.17
162	.94	.88	.82	.76	.70	.64	.58	.52	.46	.40
163	.96	.93	.89	.85	.81	.78	.74	.70	.67	.63
164	.99	.97	.96	.94	.93	.92	.90	.89	.87	.86
165	14.01	28.02	42.03	56.04	70.05	84.06	98.06	112.07	126.08	140.09
166	14.03	28.07	42.10	56.13	70.16	84.20	98.23	112.26	126.29	140.33
167	.06	.11	.17	.23	.28	.34	.40	.45	.51	.56
168	.08	.16	.24	.32	.40	.48	.56	.64	.72	.80
169	.10	.21	.31	.42	.52	.63	.73	.84	.94	141.04
170	.13	.26	.39	.52	.65	.78	.90	113.03	127.16	.29
171	14.15	28.31	42.46	56.61	70.77	84.92	99.08	113.23	127.38	141.54
172	.18	.36	.53	.71	.89	85.07	.25	.43	.60	.78
173	.20	.41	.61	.82	71.02	.22	.43	.63	.84	142.04
174	.23	.46	.69	.92	.15	.38	.61	.84	128.07	.30
175	.26	.51	.77	57.03	.28	.54	.80	114.06	.31	.57
176	14.28	28.57	42.85	57.14	71.42	85.70	99.99	114.27	128.55	142.84
177	.31	.62	.93	.24	.55	.86	100.17	.49	.80	143.11
178	.34	.68	43.01	.35	.69	86.03	.36	.70	129.04	.38
179	.37	.73	.10	.46	.83	.20	.56	.93	.29	.66
180	.39	.79	.18	.58	.97	.37	.76	115.16	.55	.94
181	14.42	28.85	43.27	57.69	72.12	86.54	100.97	115.39	129.81	144.24
182	.45	.91	.36	.81	.27	.72	101.17	.63	130.08	.53
183	.48	.97	.45	.93	.41	.90	.38	.86	.35	.83
184	.51	29.03	.54	58.05	.56	87.08	.58	116.10	.61	145.13
185	.54	.09	.63	.18	.72	.26	.81	.35	.90	.44
186	14.58	29.15	43.73	58.30	72.88	87.45	102.03	116.61	131.18	145.76
187	.61	.22	.82	.43	73.04	.65	.26	.87	.47	146.08
188	.64	.28	.92	.56	.20	.85	.49	117.13	.77	.41
189	.68	.35	44.03	.70	.38	88.05	.73	.40	132.08	.75
190	.71	.42	.13	.84	.55	.26	.97	.68	.39	147.10
191	14.75	29.49	44.24	58.99	73.73	88.48	103.23	117.97	132.72	147.47
192	.78	.57	.35	59.13	.92	.70	.48	118.27	133.05	.84
193	.82	.64	.46	.29	74.11	.93	.75	.57	.39	148.21
194	.86	.72	.58	.44	.30	89.16	104.02	.87	.73	.59
195	.90	.80	.69	.59	.49	.39	.29	119.18	134.08	.98
196	14.94	29.87	44.81	59.75	74.69	89.62	104.56	119.50	134.43	149.37
197	.98	.96	.93	.91	.89	.87	.84	.82	.80	.78
198	15.02	30.04	45.06	60.08	75.09	90.11	105.13	120.15	135.17	150.19
199	.06	.12	.19	.25	.31	.37	.43	.49	.56	.62
200	.11	.21	.32	.42	.53	.64	.74	.85	.95	151.06

Water 100 pounds = 12.00 gallons.

TABLE III.—*Giving the respective volumes of absolute alcohol and water contained in 100 volumes of spirits of different strengths, and the specific gravities, referred to water at 60° as unity.*

RESPECTIVE VOLUMES OF ALCOHOL AND WATER, AND SPECIFIC GRAVITY.

Per cent.	Alcohol.	Water.	Specific gravity.	Per cent.	Alcohol.	Water.	Specific gravity.
	<i>Vols.</i>	<i>Vols.</i>			<i>Vols.</i>	<i>Vols.</i>	
1	0.50	99.53	.99929	61	30.50	72.25	.96484
2	1.00	99.06	.99858	62	31.00	71.79	.96426
3	1.50	98.59	.99787	63	31.50	71.33	.96364
4	2.00	98.13	.99716	64	32.00	70.87	.96302
5	2.50	97.66	.99645	65	32.50	70.42	.96240
6	3.00	97.19	.99574	66	33.00	69.96	.96178
7	3.50	96.72	.99503	67	33.50	69.49	.96114
8	4.00	96.25	.99431	68	34.00	69.03	.96049
9	4.50	95.78	.99360	69	34.50	68.57	.95982
10	5.00	95.32	.99289	70	35.00	68.10	.95915
11	5.50	94.85	.99224	71	35.50	67.64	.95847
12	6.00	94.39	.99160	72	36.00	67.17	.95779
13	6.50	93.93	.99098	73	36.50	66.70	.95707
14	7.00	93.48	.99036	74	37.00	66.23	.95635
15	7.50	93.02	.98974	75	37.50	65.77	.95564
16	8.00	92.56	.98911	76	38.00	65.30	.95492
17	8.50	92.10	.98849	77	38.50	64.82	.95417
18	9.00	91.64	.98787	78	39.00	64.35	.95342
19	9.50	91.18	.98725	79	39.50	63.88	.95267
20	10.00	90.72	.98663	80	40.00	63.41	.95192
21	10.50	90.26	.98608	81	40.50	62.93	.95112
22	11.00	89.81	.98552	82	41.00	62.45	.95031
23	11.50	89.36	.98497	83	41.50	61.97	.94950
24	12.00	88.91	.98441	84	42.00	61.50	.94869
25	12.50	88.45	.98386	85	42.50	61.01	.94785
26	13.00	88.00	.98330	86	43.00	60.53	.94701
27	13.50	87.55	.98275	87	43.50	60.05	.94617
28	14.00	87.10	.98220	88	44.00	59.57	.94532
29	14.50	86.65	.98167	89	44.50	59.08	.94446
30	15.00	86.20	.98114	90	45.00	58.60	.94359
31	15.50	85.75	.98063	91	45.50	58.12	.94271
32	16.00	85.30	.98011	92	46.00	57.63	.94183
33	16.50	84.85	.97959	93	46.50	57.14	.94093
34	17.00	84.40	.97907	94	47.00	56.66	.94003
35	17.50	83.95	.97856	95	47.50	56.16	.93909
36	18.00	83.50	.97804	96	48.00	55.67	.93815
37	18.50	83.05	.97753	97	48.50	55.18	.93721
38	19.00	82.60	.97702	98	49.00	54.69	.93627
39	19.50	82.16	.97651	99	49.50	54.20	.93532
40	20.00	81.71	.97600	100	50.00	53.71	.93437
41	20.50	81.26	.97549	101	50.50	53.21	.93341
42	21.00	80.81	.97498	102	51.00	52.72	.93245
43	21.50	80.36	.97447	103	51.50	52.22	.93144
44	22.00	79.91	.97396	104	52.00	51.72	.93043
45	22.50	79.47	.97344	105	52.50	51.22	.92941
46	23.00	79.02	.97292	106	53.00	50.73	.92839
47	23.50	78.57	.97241	107	53.50	50.23	.92737
48	24.00	78.12	.97190	108	54.00	49.73	.92635
49	24.50	77.67	.97139	109	54.50	49.22	.92531
50	25.00	77.22	.97087	110	55.00	48.72	.92427
51	25.50	76.77	.97034	111	55.50	48.22	.92322
52	26.00	76.32	.96981	112	56.00	47.72	.92217
53	26.50	75.87	.96928	113	56.50	47.22	.92111
54	27.00	75.42	.96874	114	57.00	46.71	.92004
55	27.50	74.97	.96821	115	57.50	46.21	.91896
56	28.00	74.52	.96767	116	58.00	45.70	.91788
57	28.50	74.06	.96711	117	58.50	45.19	.91679
58	29.00	73.61	.96655	118	59.00	44.69	.91569
59	29.50	73.16	.96598	119	59.50	44.18	.91458
60	30.00	72.70	.96541	120	60.00	43.67	.91346

TABLE III—Continued.

RESPECTIVE VOLUMES OF ALCOHOL AND WATER, AND SPECIFIC GRAVITY.

Per cent.	Alcohol.	Water.	Specific gravity.	Per cent.	Alcohol.	Water.	Specific gravity.
	<i>Vols.</i>	<i>Vols.</i>			<i>Vols.</i>	<i>Vols.</i>	
121	60.50	43.16	.91234	161	80.50	22.28	.86244
122	61.00	42.65	.91122	162	81.00	21.74	.86104
123	61.50	42.14	.91010	163	81.50	21.20	.85962
124	62.00	41.63	.90897	164	82.00	20.66	.85820
125	62.50	41.12	.90784	165	82.50	20.12	.85678
126	63.00	40.61	.90671	166	83.00	19.58	.85535
127	63.50	40.10	.90556	167	83.50	19.04	.85390
128	64.00	39.59	.90441	168	84.00	18.50	.85245
129	64.50	39.07	.90326	169	84.50	17.95	.85098
130	65.00	38.56	.90211	170	85.00	17.41	.84950
131	65.50	38.05	.90093	171	85.50	16.86	.84803
132	66.00	37.53	.89975	172	86.00	16.32	.84656
133	66.50	37.01	.89856	173	86.50	15.77	.84502
134	67.00	36.50	.89737	174	87.00	15.22	.84347
135	67.50	35.98	.89616	175	87.50	14.66	.84189
136	68.00	35.46	.89495	176	88.00	14.11	.84031
137	68.50	34.94	.89375	177	88.50	13.55	.83873
138	69.00	34.42	.89254	178	89.00	12.99	.83715
139	69.50	33.90	.89129	179	89.50	12.43	.83550
140	70.00	33.38	.89003	180	90.00	11.87	.83385
141	70.50	32.86	.88878	181	90.50	11.30	.83216
142	71.00	32.33	.88753	182	91.00	10.74	.83046
143	71.50	31.81	.88627	183	91.50	10.17	.82876
144	72.00	31.29	.88500	184	92.00	9.60	.82706
145	72.50	30.76	.88374	185	92.50	9.03	.82536
146	73.00	30.24	.88247	186	93.00	8.46	.82365
147	73.50	29.71	.88119	187	93.50	7.88	.82179
148	74.00	29.19	.87990	188	94.00	7.30	.81990
149	74.50	28.66	.87860	189	94.50	6.71	.81797
150	75.00	28.	.87730	190	95.00	6.11	.81601
151	75.50	27.61	.87599	191	95.50	5.51	.81402
152	76.00	27.08	.87467	192	96.00	4.91	.81199
153	76.50	26.55	.87334	193	96.50	4.31	.80993
154	77.00	26.02	.87200	194	97.00	3.71	.80786
155	77.50	25.48	.87067	195	97.50	3.10	.80571
156	78.00	24.95	.86933	196	98.00	2.48	.80356
157	78.50	24.42	.86796	197	98.50	1.87	.80137
158	79.00	23.88	.86659	198	99.00	1.25	.79918
159	79.50	23.35	.86522	199	99.50	0.62	.79690
160	80.00	22.81	.86384	200	100.00	0.00	.79461

Letter of the Vice-President of the National academy of sciences
communicating, in obedience to law, a report of the proceedings of the
Academy during the year 1866

Washington 1866

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